FINAL ADDENDUM

TO

THE FINAL EIS

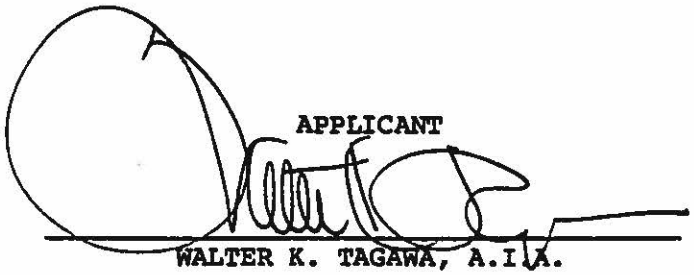
Ewa Marina Community

INCREMENT II

FINAL ADDENDUM
TO
THE FINAL
ENVIRONMENTAL IMPACT STATEMENT
FOR
INCREMENT II
PROPOSED EWA MARINA COMMUNITY
EWA, OAHU, HAWAII

PREPARED PURSUANT TO:

CHAPTER 343, HAWAII REVISED STATUTES



APPLICANT

WALTER K. TAGAWA, A.I.A.
PRESIDENT
MSM & ASSOCIATES

PREPARED
BY
DAMES & MOORE

JULY 7, 1986

A. COVER SHEET

FINAL ADDENDUM
TO
THE FINAL
ENVIRONMENTAL IMPACT STATEMENT
FOR
INCREMENT II
PROPOSED EWA MARINA COMMUNITY
EWA, OAHU, HAWAII

A Final Environmental Impact Statement (EIS) was submitted on December 9, 1985 to the City and County of Honolulu, Department of Land Utilization (DLU) as part of State and County permit actions relating to the proposed Ewa Marina Community, Increment II. DLU determined the EIS to be non-acceptable as per their letter of December 20, 1985. The letter, presented at the end of this section, mentions four areas of the EIS determined to be inadequate. These include Alternative Channel Alignments, Marine Benthic Habitat, Groundwater Hydrology, and Roads and Traffic. DLU also expressed concern regarding the water quality of the proposed marina.

Complying with Chapter 343 requirements, Declaratory Ruling #83-01, the applicant has prepared the following Addendum to address the deficiencies of the Final EIS. The Draft Addendum was available for public review from May 20 to June 23. Comments on the Draft are incorporated into Chapter J of this Final Addendum.

One major design change has taken place since the Final EIS. The applicant has chosen a new marina entrance channel. DLU and other commenting parties pointed out that one of the Alternative Channel Alignments mentioned in the Final EIS deserved a more thorough investigation, because it could prove to have less adverse impact on the environment. After correspondence with the State Office of Environmental Quality Control (OEQC), it was determined procedurely acceptable to introduce the new proposed alignment in the Addendum (See Chapter G). Chapter D of the Addendum describes the new proposed entrance channel and compares it to the previously proposed entrance channel.

THE PROJECT AND ENVIRONMENTAL ASSESSMENT PROCESS

The proposed Ewa Marina Community is a planned, marine-oriented community for 15,000 residents. The total area of the proposed development is about 735 acres. The development would consist of 4,850 residential units on 25 different development areas. A 1,510 slip marina would be constructed within a 115 acre waterway. The marina would open to the ocean, affording access for public marina users and private residential users. About 58 acres of commercial development are also planned.

The entire project is planned for development in two increments, Increment I consists of about 169 acres. Increment II consists of about 565.7 acres.

The entire Ewa Marina Community was the subject of a programmatic EIS in February 1981. The programmatic EIS was subsequently accepted by DLU, with the requirements that a supplemental EIS be prepared for each of the two planned increments. The supplemental EIS for Increment I was completed in March, 1984. The Increment II supplemental EIS built upon the programmatic EIS and benefited from the information developed and presented in the Increment I supplemental EIS.

The development of Increment II requires environmental permits at the Federal, State and City and County levels. Each of the Federal, State and City & County permits require preparation of an EIS.

Discussions on the EIS and permitting process for Increment II were started in April, 1984 with the three major agencies having permit jurisdiction over Increment II: DLU, the Department of Land and Natural Resources (DLNR), and the Corps of Engineers (COE).

A Notice of Preparation document for Increment II was submitted on November 8, 1984 as a joint Federal/State document, and it was assumed that one EIS would be processed to address both Federal and State concerns. However, while preparing the Draft EIS, the COE chose to write their own document for Federal processing.

The COE Draft EIS for Increment II of the Ewa Marina Community, scheduled to be published in October of this year, will address COE concerns regarding the permit for the marina.

The Final Supplemental EIS and this Addendum are required for the State Conservation District Use application (CDUA) and the county Shoreline Management Area application (SMA). The DLNR has indicated that they will require an additional Revised EIS for the project during the CDUA process, should the Final EIS and Addendum accepted by DLU not adequately address DLNR concerns.

An anticipated schedule for processing of the EIS, the zoning change, SMA, and CDUA has been developed. This schedule is "idealized" in that dates that are established by the agencies involved (e.g. public hearing dates) have been selected based upon present anticipated dates. The actual dates will be established by the agency following review of submitted material.

EWA MARINA COMMUNITY INCREMENT II
ANTICIPATED PERMITTING SCHEDULE

ACTION	DEADLINE
CHAPTER 343 EIS PROCESSING	
Issue Notice of Preparation	08 Nov 1984
End 30 Day Consultation Period	08 Dec 1984
Prepare DEIS	286 days
File DEIS	20 Sep 1985
End 45 Day Agency/Public Review	07 Nov 1985
Revise DEIS	19 days
File Revised EIS	05 Dec 1985
DLU Acceptance (determined non-acceptable)	19 Dec 1985
File Draft Addendum	20 May 1986
Begin 30-Day Agency/Public Review	23 May 1986
End 30-Day Agency/Public Review	22 Jun 1986
Revise Addendum	14 days
File Revised Addendum	07 Jul 1986
DLU Acceptance	22 Jul 1986
ZONING CHANGE PROCESSING	
Application Submitted	01 Jun 1986
EIS Completed	22 Jul 1986
Application Accepted	31 Jul 1986
120 Day DLU Review Completed	28 Nov 1986
45-Day Planning Commission Review Completed	12 Jan 1987
Public Hearing	NA
City Council Review	90 days
Change Approved	12 Apr 1987
SHORELINE MANAGEMENT PERMIT	
Start DLU Processing	NA
Application Accepted (After Zoning Change)	28 Nov 1986
Public Hearing	NA
DLU Acceptance	NA
City Council Hearing	NA
Acceptance and Permit Issuance (30 days)	01 May 1987
CONSERVATION DISTRICT USE APPLICATION	
Application Submitted	01 Mar 1987
Application Accepted (w/SMA acceptance)	01 May 1987
EIS Required Notification	NA
Public Hearing	NA
CDUA Issued (180 days after acceptance)	28 Oct 1987

NA = not available at this time

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4432

FRANK F. FASI
MAYOR

JOHN P. WHALEN
DIRECTOR

79/SMA-139(RF)

December 20, 1985

Ms. Jennifer J. Kleveno
Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816

Dear Ms. Kleveno:

Final Supplemental Environmental Impact Statement (SEIS)
Ewa Marina Community - Increment II
MSM and Associates, Inc.
Tax Map Keys 9-1-12: 7-17, Portions 2, 5, 6

Attached is a copy of our report on the subject SEIS, which we have found to be non-acceptable for the reasons given. The report gives two options for satisfying Chapter 343 requirements: (1) preparation of a new SEIS, or (2) preparation of an addendum. Also attached is a copy of the Declaratory Ruling addressing the latter option.

If you have any questions, please contact Mr. Robin Foster of our staff at 527-5027.

Very truly yours,

for JOHN P. WHALEN
Director of Land Utilization

JPW:sl
2603A

cc: MSM & Assoc., Inc.

DEPARTMENT OF LAND UTILIZATION (DLU)
79/SMA-139(RF)
December 20, 1985

REPORT OF NON-ACCEPTANCE: CHAPTER 343, HRS
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (SEIS)
EWA MARINA COMMUNITY-INCREMENT II
MSM AND ASSOCIATES, INC.
HONOULIULI, EWA, OAHU, HAWAII
TAX MAP KEY 9-1-12: 7-17, Portion 2, 5, 6

A. BACKGROUND

On February 20, 1981, the DLU accepted the EIS for the Ewa Marina Community development as the programmatic EIS describing the overall project in concept. This acceptance was conditioned with the requirement that more detailed Supplemental EISs would be submitted to disclose the particular impacts of the development of each of the two increments of the proposed project. Increment I consists of a portion of the project site on the east; Increment II consists of the remainder of the project site, including the proposed marina. The applicant was directed to address the following specific topic areas:

1. Drainage/Grading/Soils
2. Archaeological/Historical
3. Flora/Fauna
4. Sewage Disposal/Groundwater Impacts
5. Solid Waste Disposal
6. Review of Recreational Resources
   a. Impact on Existing Resources
   b. Recreational Facilities to be Created
7. Visual
8. Traffic/Noise/Air Quality/Circulation
9. Housing - Unit Count/Type
10. Water Commitment
11. Impact to Public Services/Utilities

The Supplemental EIS for Increment I was accepted by the DLU on April 16, 1984. This report concerns the SEIS for Increment II.

The proposed Ewa Marina Community is planned as a marine-oriented community for 15,000 residents. The total area of the proposed development is about 734.7 acres. The development will consist of 4,850 residential units on 25 different development areas. A 1,600 slip marina would be constructed within a 115-acre waterway. The marina would open to the

ocean, affording access for public marina users and private residential users. About 66.9 acres of commercial development are also planned.

The entire project would be developed in two increments. Increment I would consist of about 169 acres, and Increment II would consist of about 565.7 acres, as follows:

Increment I	148.6	acres	residential
	2	acres	commercial/public facility
	4.4	acres	park
	14	acres	arterial roadways
Increment II	307.5	acres	residential
	64.9	acres	commercial/public facility
	27.5	acres	preservation
	115	acres	marina
	20.3	acres	park
	30.5	acres	arterial roadways

M.S.M. & Associates, Inc. proposes to develop Ewa Marina Community, Increment II, as a part of the secondary urban center on the Ewa Plain. The community is planned as a water-oriented residential community. The purpose of the proposed project is to benefit the public by providing:

- Increased recreational resources both water-borne and shoreside;
- increased housing (3500 units) on the Ewa Plain to accommodate secondary urban center needs;
- more harbor facilities and boat slips;
- increased public access to the Ewa coastline;
- increased employment opportunities in the Ewa Plain area; and
- increased commercial and specialty shops for the Ewa area.

The proposed Master Plan for the Ewa Marina Community is consistent with the Land Use Map of the City's Ewa Development Plan. (The Development Plan Land Use Map redesignations for Increment II were approved by the City Council in 1983.) The entire area lies within the State Urban District.

Zoning for Increment I was approved by the City Council in 1985. The developer filed an application for rezoning of the entire Increment II concurrently with the filing of the Draft SEIS.

A significant portion of Increment II lies within the City's Special Management Area (SMA). Ordinance No. 85-105, approved on December 2, 1985, amended the SMA boundaries to include areas in and around the proposed marina waterways as well as shoreline areas. A SMA permit will be required for the project.

Construction of the marina, the entrance channel and breakwaters will require a Conservation District Use Application from the Board of Land and Natural Resources, as well as a permit from the U.S. Army Corps of Engineers (COE). The COE is preparing a separate EIS to satisfy federal requirements.

Major environmental conditions affecting the proposal include aircraft noise and accident potential zones associated with Barber's Point Naval Air Station; and stormwater runoff from the Kaloi Gulch watershed, for which an offsite 125-acre retention basin is proposed.

Anticipated major environmental impacts include the following: conversion of 115 acres of land to marina; losses to marine benthic communities inhabiting coastal waters in and around the proposed marina entrance channel, due to dredging and other construction activities; loss of 400 feet of existing ocean frontage and consequent disruption of access along the shoreline; loss of a surfing site; increased noise; increased demand for police and fire protection, school facilities, municipal solid waste disposal services, and public utilities; additional demand on water supply, sewage treatment facilities, highways and roads; the loss of about 64 archaeological features; the preservation of several archaeological features, which will be made accessible to the general public; and the preservation of a small wetland area.

B. PROCEDURES

1. The DLU issued a Preparation Notice for the SEIS, which was published in the "Office of Environmental Quality Control (OEQC) Bulletin" on November 8, 1984. The Notice was sent to various agencies and organizations.

2. Comments on the Preparation Notice were received from nine parties. The applicant responded in writing to these comments. The comments and responses are included in Appendix C of the Final SEIS.

3. The Draft EIS was received and distributed by the OEQC. Notice of the request for comments was published in the "OEQC Bulletin" of September 23, 1985. The applicant requested an extension of the public comment period to 45 days, to run concurrently with the DLU's zoning agency review; and consequently the deadline for comments was established as November 7, 1985.

4. During the comment period, 25 parties submitted written comments. In addition, five parties - the U. S. Army Corps of Engineers (COE), Barber's Point Naval Air Station, the State Department of Land and Natural Resources (DLNR), the State Department of Transportation (DOT), and the City Department of Transportation Services (DTS) - submitted comments after the deadline had passed. On November 8, 1985, the SEIS preparer, Dames & Moore, requested and received from the DLU an extension of time to December 4, 1985, to respond to public comments and an extension to December 21, 1985, for the DLU's determination of acceptability.

5. The preparer responded in writing to all comments received by December 4, 1985.

6. The DLU received the Final SEIS on December 9, 1985.

In conclusion, the DLU finds that the applicant has complied with the EIS procedures in accordance with Section 1:71(a) of the EIS Regulations.

C. CONTENT

In most respects, the Final SEIS for Increment II - considered together with the programmatic EIS - adequately addresses the content and style requirments specified in Sections 1:42 and 1:43 of the EIS Regulations. However, we find the SEIS to be inadequate in certain critical aspects, as follows:

1. Project Description and Alternatives

Alternative Channel Alignments: Construction of the proposed marina channel alignment would cause the destruction of surfing sites. The SEIS briefly discusses four alternatives, Alternative 3 of which "eliminates any impacts to Oneula Beach Park and significantly reduces adverse effects on the surfing sites" (Final SEIS. p. 4-40). The discussion states four disadvantages to Alternative 3, but lacks full evaluation of the costs and

benefits. The chief drawback appears to be increased water residence times in certain sections of the marina. As noted in the comments of the Department of General Planning, however, the impact of increased residence times on marina water quality is inadequately discussed and other disadvantages are not quantified. If residence times constitute a serious problem, then one possible solution is elimination of the two eastern marina channels which would be worst affected (Channels G and H). At any rate, we believe that further serious consideration should be given to this alternative, including a detailed analysis of its impacts relative to those of the proposed alignment.

2. Description of the Affected Environment

Marine Benthic Habitat: According to the DLNR, the SEIS lacks adequate information on the marine benthic habitat specific to the proposed marine channel alignment. The DLNR had specifically requested photographic and written documentation in its resporse to the SEIS Preparation Notice.

3. Environmental Impacts of the Proposed Action

a. Groundwater Hydrology: The SEIS lacks information on the existing caprock aquifer and the potential effects of groundwater loss and salt water contamination resulting from construction of the proposed marina. It appears likely that the project will affect brackish water resources in the area currently used by Oahu Sugar Company and potentially useable in the area's future dual water system. The preparer has stated that a hydrogeological study currently underway will address these issues. The results of this study should be included in the SEIS.

b. Roads and Traffic: The SEIS discusses the construction of a new north-south road running from Increment II only as far north as Renton Road. The purpose of the north-south connector as discussed in the traffic study appended to the programmatic EIS, was to provide an additional linkage to the H-1 Highway. Constructing the new road only as far as Renton Road will have impacts on the northern section of Ft. Weaver Road and its Renton Road intersection; these impacts have not been discussed. In its comments on the Draft SEIS, the State DOT commented, "Since we find that this

impact has not been previously evaluated, we feel it should be thoroughly discussed in the EIS before acceptance of the final document is recommended" (letter dated November 8, 1985).

In addition to the above, we share the concern of numerous commenting parties regarding the flushing characterics of the marina, the impacts of high-nutrient runoff, the length of residence times, and the consequent potential for poor water quality in the marina.

D. RESPONSES TO COMMENTS

The applicant generally provided adequate point-by-point responses to comments, except with regard to the content areas noted above. The response to the State DOT's comments, however, is inadequate and must be supplemented.

E. UNRESOLVED ISSUES

All of the issues discussed in Section C above are considered to be unresolved at the present time.

F. DETERMINATION

The Final SEIS is determined to be non-acceptable under the criteria established in the EIS Regulations, specifically Sections 1:71(b) and (c), for the reasons cited above. The inadequacies may be addressed by the processing of a new SEIS for Increment II, or by the processing of an addendum, pursuant to the Environmental Quality Commission's Declaratory Ruling #83-01, "Concerning Procedures for Correcting a Non-Accepted EIS."

for JOHN P. WHALEN
Director of Land Utilization

JPW:sl
2602A

GEORGE R. ARIYOSHI
GOVERNOR

ROY R. TAKEMOTO
CHAIRMAN

STATE OF HAWAII
ENVIRONMENTAL QUALITY COMMISSION
550 HALEKAUWILA ST.
ROOM 301
HONOLULU, HAWAII 96813

TELEPHONE NO.
(808) 548-6915

DECLARATORY RULING #83-01: CONCERNING PROCEDURES FOR CORRECTING A NON-ACCEPTED EIS

The Environmental Quality Commission has, on its own motion, ruled upon a recurring question that has lent itself to conflicting interpretations. This ruling was made at the Commission meeting on June 20, 1983.

The problem involves the procedure for correcting a non-accepted EIS. At the present time, the EIS Regulations do not contain procedures for correcting deficiencies in a non-accepted EIS.

Therefore, the Environmental Quality Commission declares as follows:

> In cases where the EIS is not accepted by the accepting authority, an addendum must be prepared that addresses its deficiencies. This document must then be submitted for public review as if it were a draft EIS. A 30-day period for public review of the addendum will commence as of the date the notice of availability is published in the EQC Bulletin. The requirements for filing, distribution, publication of availability for review, acceptance or non-acceptance and notification and publication of acceptability shall be the same as the requirements for a draft EIS.

This declaratory ruling shall not preclude the applicant or proposing agency from preparing an entirely new EIS.

B. SUMMARY

DLU, the accepting agency, found four deficiencies in the Final EIS for the proposed Ewa Marina Community. These deficiencies are as follows:

1. Under section 4.8.3 of the Final EIS, entitled Alternative Channel Alignments, DLU suggested further consideration be given to Alternative 3, which presented the marina entrance channel 300 yards west of the proposed entrance channel. DLU suggested the further consideration include a detailed analysis of the impacts of Alternative 3 to those of the proposed alignment.

2. According to DLU and DLNR, the Final EIS lacked adequate information on the marine benthic habitat specific to the proposed channel alignment.

3. Similarly, DLU found the EIS lacked information on the existing caprock aquifer and on the potential effects of groundwater loss and salt water contamination due to marina construction.

4. DLU determined that Section 6.4.1 of the EIS, entitled Roads and Traffic, did not adequately discuss the new north-south road and that the response to the State Department of Transportation's (DOT's) comments on the Draft EIS were inadequate.

In addition to these deficiencies, DLU and other commenting parties expressed concern for the general water quality of the proposed marina.

To address these concerns and remedy the deficiencies in the EIS, the applicant completed the following investigations:

1. A detailed evaluation of Alternative 3, which included:
   a. a general description and refinement of Alternative 3,
   b. a land use analysis of Alternative 3 and the proposed alignment,
   c. an investigation of the coastal processes relative to the two alignments,
   d. a water quality analysis of the two alignments,
   e. an investigation of the tsunami impacts relative to the two alignments, and
   f. a cost comparison of the two alignments;

2. A marine biological investigation, which included:
   a. a detailed description of the marine biology specific to the two channel alignments, and
   b. a discussion of potential impacts on the marine biology due to entrance channel dredging;

3. A hydrogeological study of the Ewa area, which included:
   a. a description of the existing groundwater conditions, and
   b. an analysis of the impacts of marina construction on the groundwater regime;

4. An analysis of the State DOT's traffic concerns, which included:
   a. meetings with DOT to resolve traffic issues,
   b. a rewrite of the letter responding to DOT's comments on the Draft EIS, and
   c. a rewrite of Sections 4.6.4 and 6.4.1 of the EIS.

This Addendum to the Final EIS presents the results of these four investigations.

While completing the detailed investigation of Alternative Channel Alignment 3, the applicant refined the channel and marina design and determined that this channel would be better than the proposed channel. Alternative 3 is located between two surfing sites, approximately 300 yards west of the proposed alignment. A channel at this location does not require the groins that the proposed channel required. Therefore, the environmental impact of Alternative 3 appears to be less than that of the proposed channel. The Addendum presents Alternative 3 as the proposed entrance channel for the marina.

C. TABLE OF CONTENTS

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D. ALTERNATIVE CHANNEL ALIGNMENTS

D.1 INTRODUCTION

Section 4.8.3 of the Final EIS, which is contained in Appendix 1, presented four alternative entrance channel alignments in addition to the proposed alignment. One of these alternatives, Alternative 3, depicted the entrance channel 300 yards west of the proposed channel. This alternative eliminated impact to Oneula Beach Park and reduced adverse impact to the existing surf sites. The EIS discussed four disadvantages to Alternative 3, but as pointed out by DLU, did not fully evaluate the benefits. DLU suggested that serious consideration be given to this alternative, including a detailed analysis of its impacts relative to those of the proposed alignment.

The developer, in further investigation of Alternative 3, concluded that it was indeed a better alternative than the proposed alignment. Therefore, the developer has chosen to use Alternative 3 as the proposed alignment for the marina entrance channel.

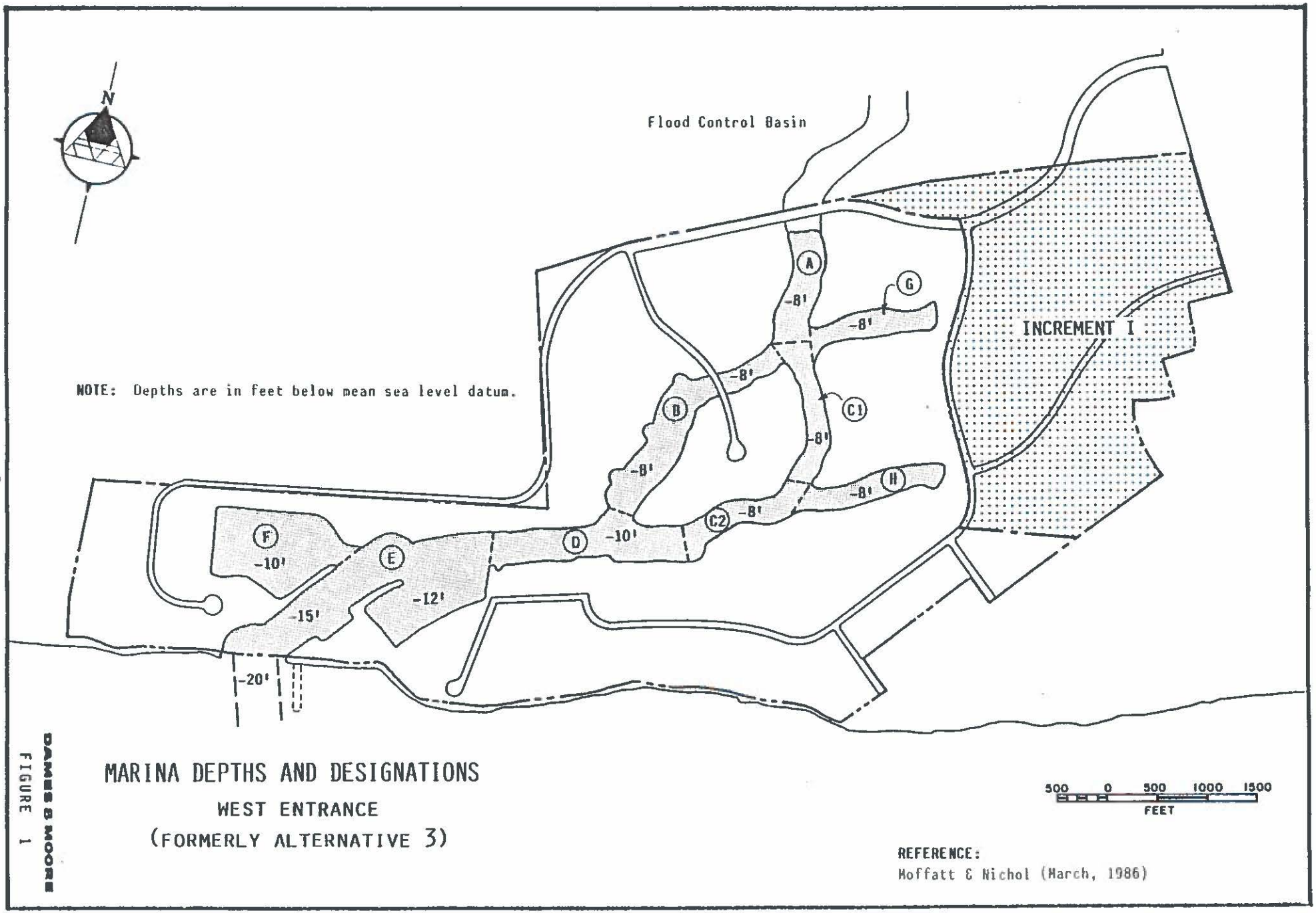
After completing more detailed engineering designs for Alternative 3, the marina engineers refined the marina configuration from the figure shown in Section 4.8.3 of the Final EIS. They determined that the jetties were not necessary and that an adjustment in the angle of the inner channel would provide better water circulation in the marina.

To avoid confusion in this report, we will refer to the refined Alternative 3 as the West Entrance and the former proposed channel alignment as the East Entrance. Figures 1 and 2 show the two entrance channel alignments.

This section of the Addendum discusses the relative impacts of the two alignments in terms of land use, coastal processes, tsunami effects, marine biology, water quality, and construction costs. The marine biology section summarizes the channel investigations that were completed for the Addendum, and the water quality section addresses concerns expressed by reviewers of the Draft EIS.

D.2 LAND USE ANALYSIS

The land use designations for the two alignments are relatively similar. They include the following:



MARINA DEPTHS AND DESIGNATIONS

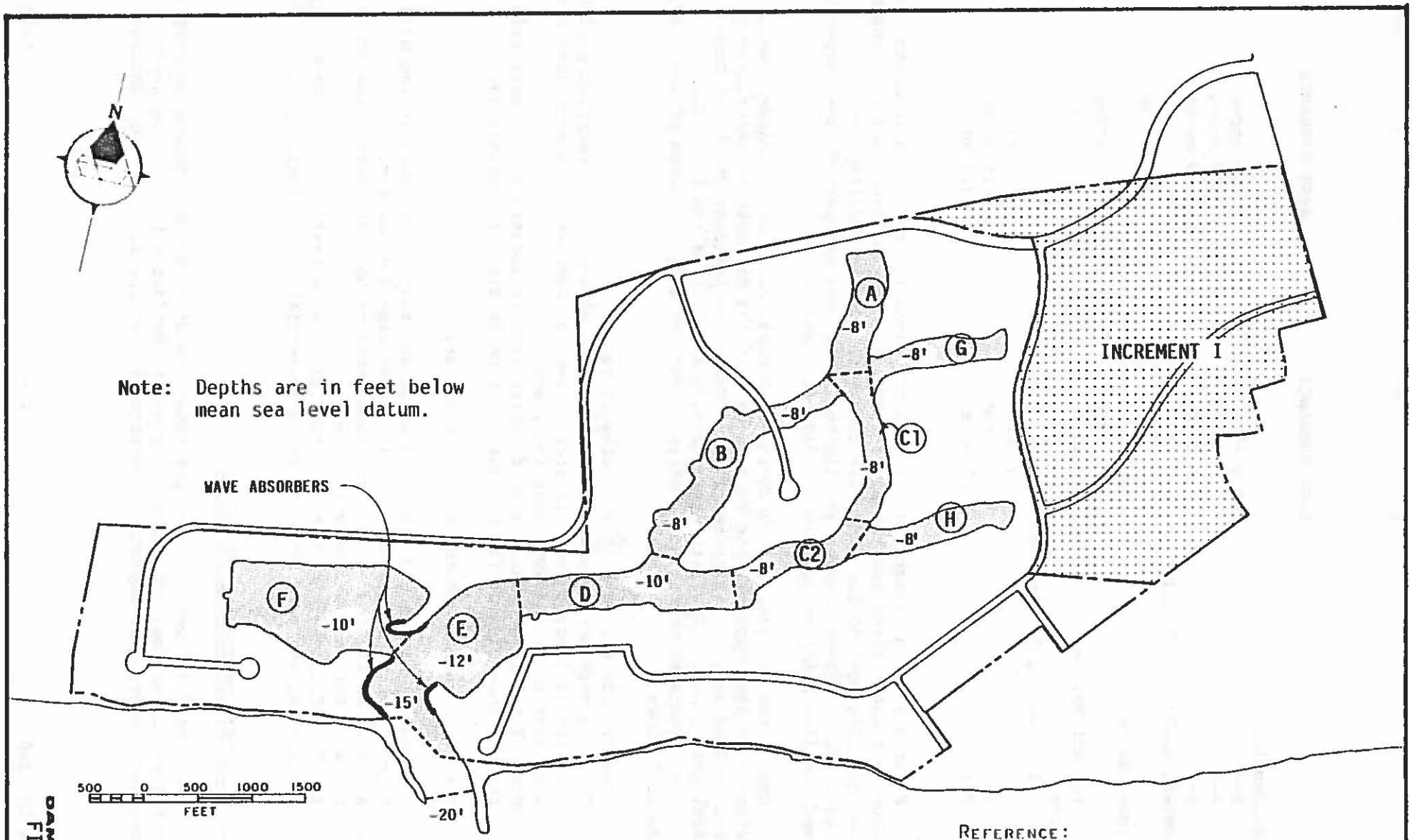
WEST ENTRANCE

(FORMERLY ALTERNATIVE 3)

REFERENCE:
Moffatt & Nichol (March, 1986)

FIGURE 1

DAMES & MOORE



DAMES & MOORE
FIGURE 2

MARINA DEPTHS AND DESIGNATIONS

EAST ENTRANCE

(FORMERLY PROPOSED ALTERNATIVE)

REFERENCE:

MSM & ASSOCIATES
EWA MARINA COMMUNITY, PROJECT SUMMARY
JANUARY 1981
MOFFATT & NICHOL (1986)

	EAST ENTRANCE	WEST ENTRANCE
Residential		
R-6	206.0 acres	206.0 acres
A-1	64.5 acres	64.5 acres
A-2	37.0 acres	37.0 acres
Commercial/Public Facility	64.9 acres	58.0 acres
Preservation	27.5 acres	30.6 acres
beneath marina	115.0 acres	119.3 acres
Parks		
P#1 (existing Oneula Beach Park)	30.0 acres	30.0 acres
P#3	15.6 acres	15.6 acres
P#4	4.7 acres	4.7 acres

Figures 3 and 4 illustrate the land use plans for the two alignments. As shown in these figures and the above table, the only designations that change from one alignment to the other are commercial/public facility and preservation. These changes are limited to the western part of the property (west of line A-A') as detailed in Figures 5 and 6.

Due to the activities at Barbers Point Naval Air Station (NASBP), which is adjacent to the property, the western part of the property is restricted to certain land uses as designated in Navy Noise and Accident Potential Zone (APZ) guidelines. (Refer to Sections 5.10 and 5.11 of the Final EIS).

The advantages of the West Entrance over the East, in terms of land use, are as follows:

1. Preservation Parcel 6 is 3.1 acres larger.
2. There is more marina acreage (4.3 acres more) and less commercial/public facility (6.9 acres less) in areas close to NASBP which is more compatible with Navy noise and APZ guidelines, and
3. More of the commercial/public facility area is located on the east side of the entrance channel further away from NASBP aircraft activities.

The disadvantages of the West Entrance are:

1. The channel inside the marina is about 800 feet longer than in the East Entrance which increases internal travel time for boaters.
2. As shown in Figures 7 and 8 the East Entrance has 1600 boat slips while the West Entrance has only 1510, and
3. The West Entrance configuration results in more traffic traveling through residential and park areas to reach commercial/public facility Parcel 5.

D.3 ANALYSIS OF COASTAL PROCESSES

Sections 5.8.2 and 6.1.1 of the Final EIS discuss the littoral processes at the Ewa coastline. The marina engineers, Moffatt & Nichol, Engineers, analyzed the probable impacts of construction of the East and West Entrances

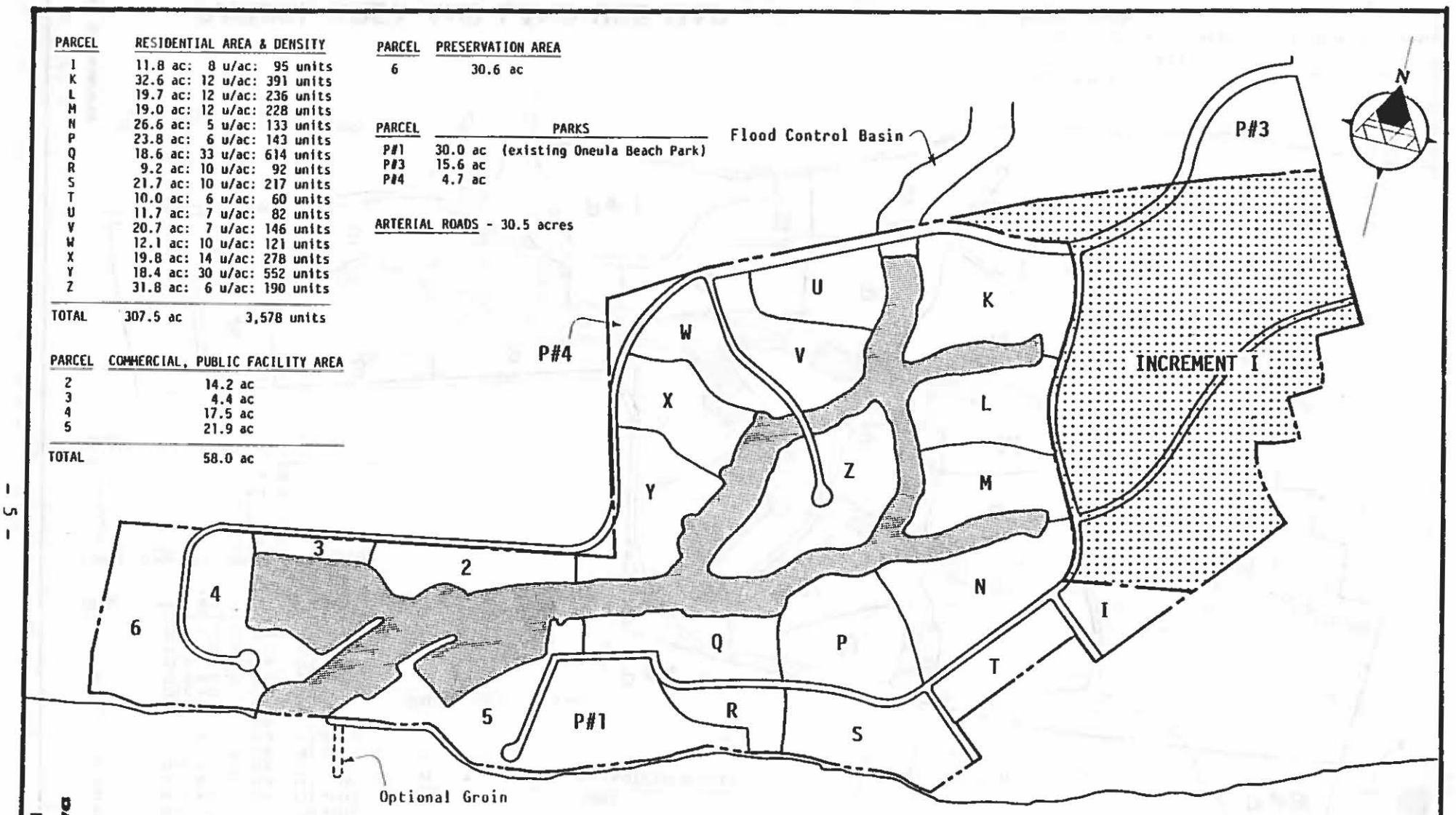
PARCEL	RESIDENTIAL AREA & DENSITY		
I	11.8 ac:	8 u/ac:	95 units
K	32.6 ac:	12 u/ac:	391 units
L	19.7 ac:	12 u/ac:	236 units
M	19.0 ac:	12 u/ac:	228 units
N	26.6 ac:	5 u/ac:	133 units
P	23.8 ac:	6 u/ac:	143 units
Q	18.6 ac:	33 u/ac:	614 units
R	9.2 ac:	10 u/ac:	92 units
S	21.7 ac:	10 u/ac:	217 units
T	10.0 ac:	6 u/ac:	60 units
U	11.7 ac:	7 u/ac:	82 units
V	20.7 ac:	7 u/ac:	146 units
W	12.1 ac:	10 u/ac:	121 units
X	19.8 ac:	14 u/ac:	278 units
Y	18.4 ac:	30 u/ac:	552 units
Z	31.8 ac:	6 u/ac:	190 units
TOTAL	307.5 ac		3,578 units

PARCEL	PRESERVATION AREA
6	30.6 ac

PARCEL	PARKS	
P#1	30.0 ac	(existing Oneula Beach Park)
P#3	15.6 ac	
P#4	4.7 ac	

ARTERIAL ROADS - 30.5 acres

PARCEL	COMMERCIAL, PUBLIC FACILITY AREA
2	14.2 ac
3	4.4 ac
4	17.5 ac
5	21.9 ac
TOTAL	58.0 ac



PARCEL AREA AND LAND USE MAP

WEST ENTRANCE

(FORMERLY ALTERNATIVE 3)

500 0 500 1000 1500

FEET

Reference:
MSM & Associates (April 1986)

DAMES & MOORE

FIGURE 3

PARCEL	RESIDENTIAL AREA & DENSITY		
I	11.8 ac:	8 u/ac:	95 units
K	32.6 ac:	12 u/ac:	391 units
L	19.7 ac:	12 u/ac:	236 units
M	19.0 ac:	12 u/ac:	228 units
N	26.6 ac:	5 u/ac:	133 units
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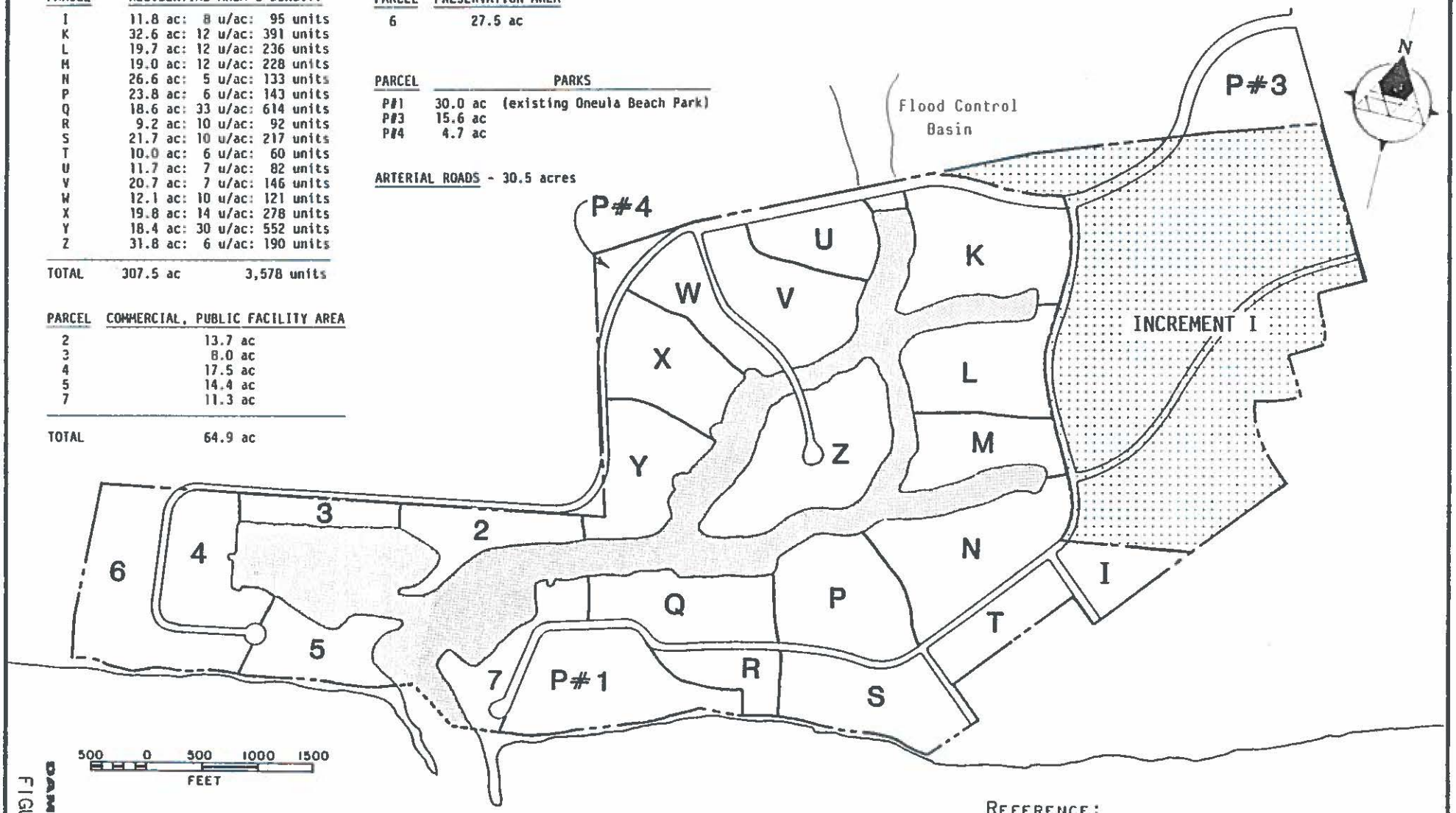
V	20.7 ac:	7 u/ac:	146 units
W	12.1 ac:	10 u/ac:	121 units
X	19.8 ac:	14 u/ac:	278 units
Y	18.4 ac:	30 u/ac:	552 units
Z	31.8 ac:	6 u/ac:	190 units
TOTAL	307.5 ac		3,578 units

PARCEL	COMMERCIAL, PUBLIC FACILITY AREA
2	13.7 ac
3	8.0 ac
4	17.5 ac
5	14.4 ac
7	11.3 ac
TOTAL	64.9 ac

PARCEL	PRESERVATION AREA
6	27.5 ac

PARCEL	PARKS	
P#1	30.0 ac	(existing Oneula Beach Park)
P#3	15.6 ac	
P#4	4.7 ac	

ARTERIAL ROADS - 30.5 acres



REFERENCE:
MSM & ASSOCIATES
EWA MARINA COMMUNITY, PROJECT SUMMARY
APRIL 1985

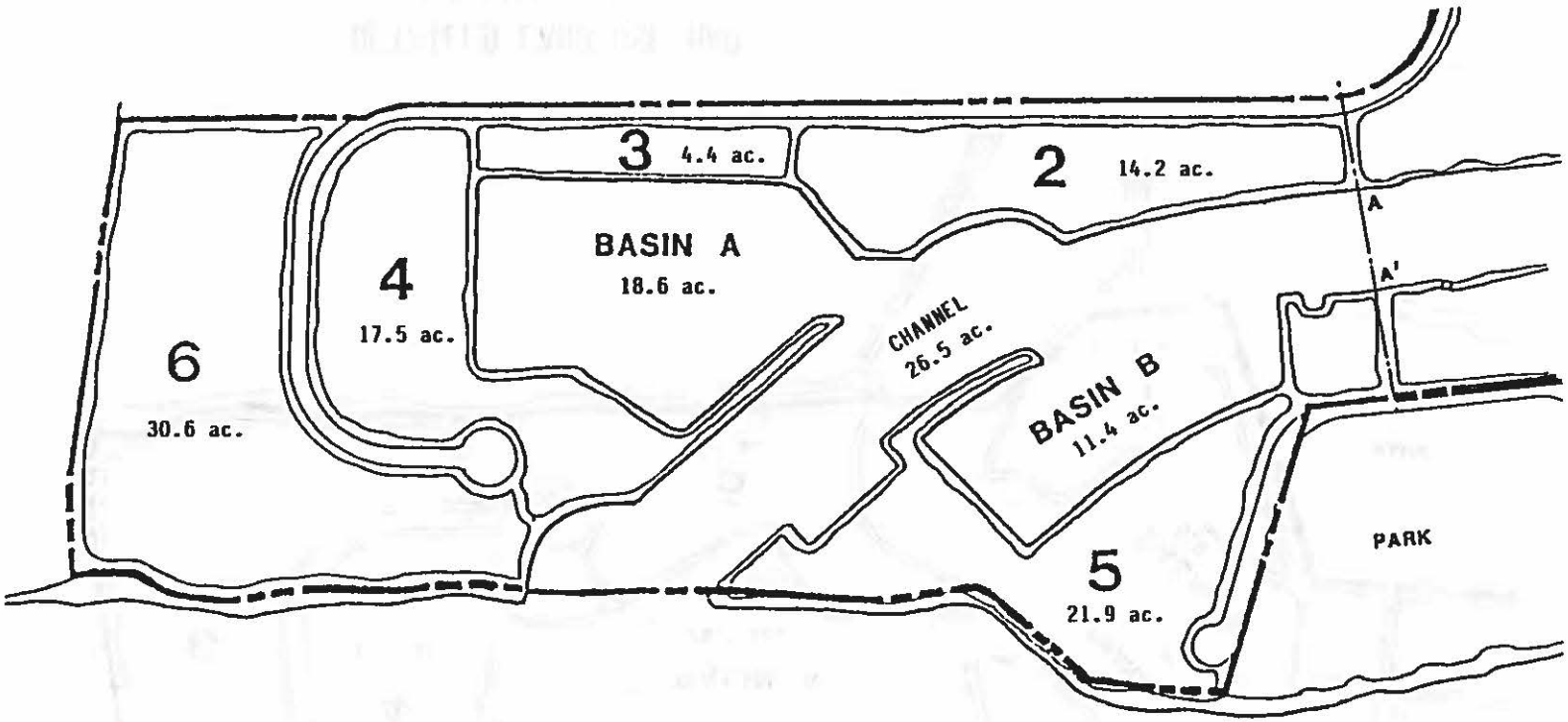
PARCEL AREA AND LAND USE MAP

EAST ENTRANCE

(FORMERLY PROPOSED ALTERNATIVE)

DAMES & MOORE

FIGURE 4



Reference: HSH & Associates (March 1986)

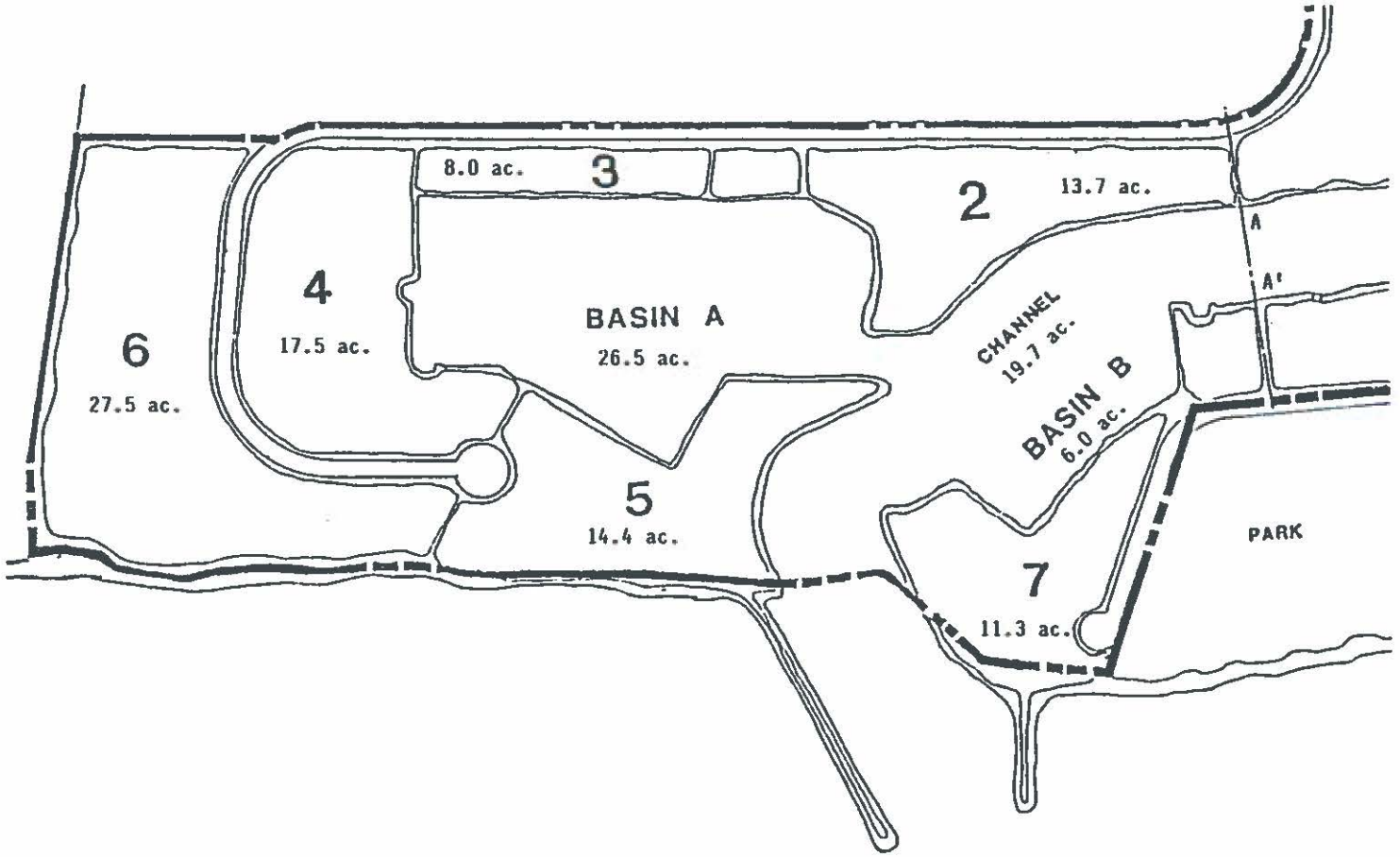
DETAILED LAND USE MAP

WEST ENTRANCE

(FORMERLY ALTERNATIVE 3)

DAMES & MOORE

FIGURE 5



DETAILED LAND USE MAP

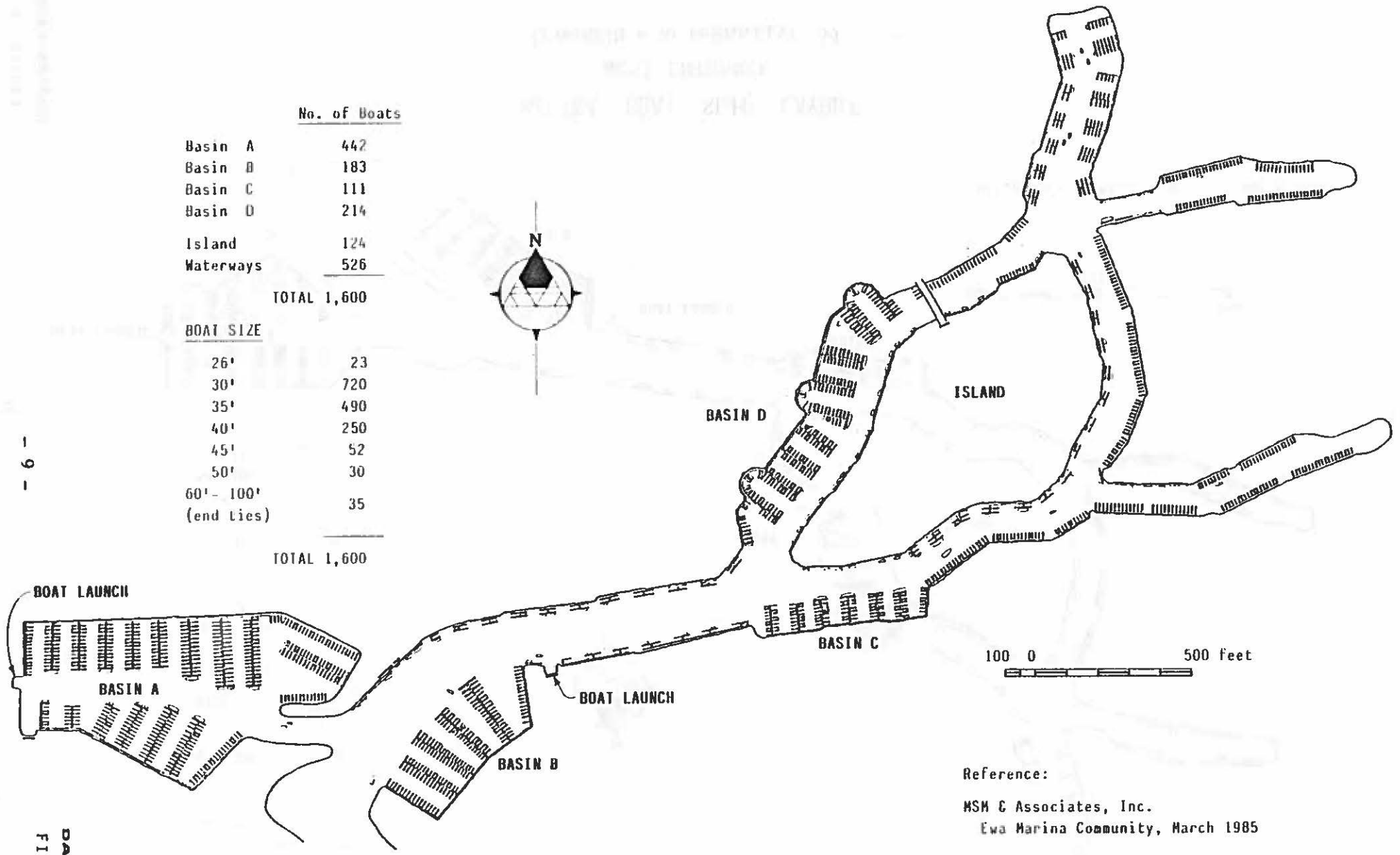
EAST ENTRANCE

(FORMERLY PROPOSED ALTERNATIVE)

Reference: MSN & Associates (March 1986)

FIGURE 9

DAMES & MOORE



Reference:

MSM & Associates, Inc.
Ewa Marina Community, March 1985

MARINA BOAT SLIP LAYOUT

EAST ENTRANCE

(FORMERLY PROPOSED ALTERNATIVE)

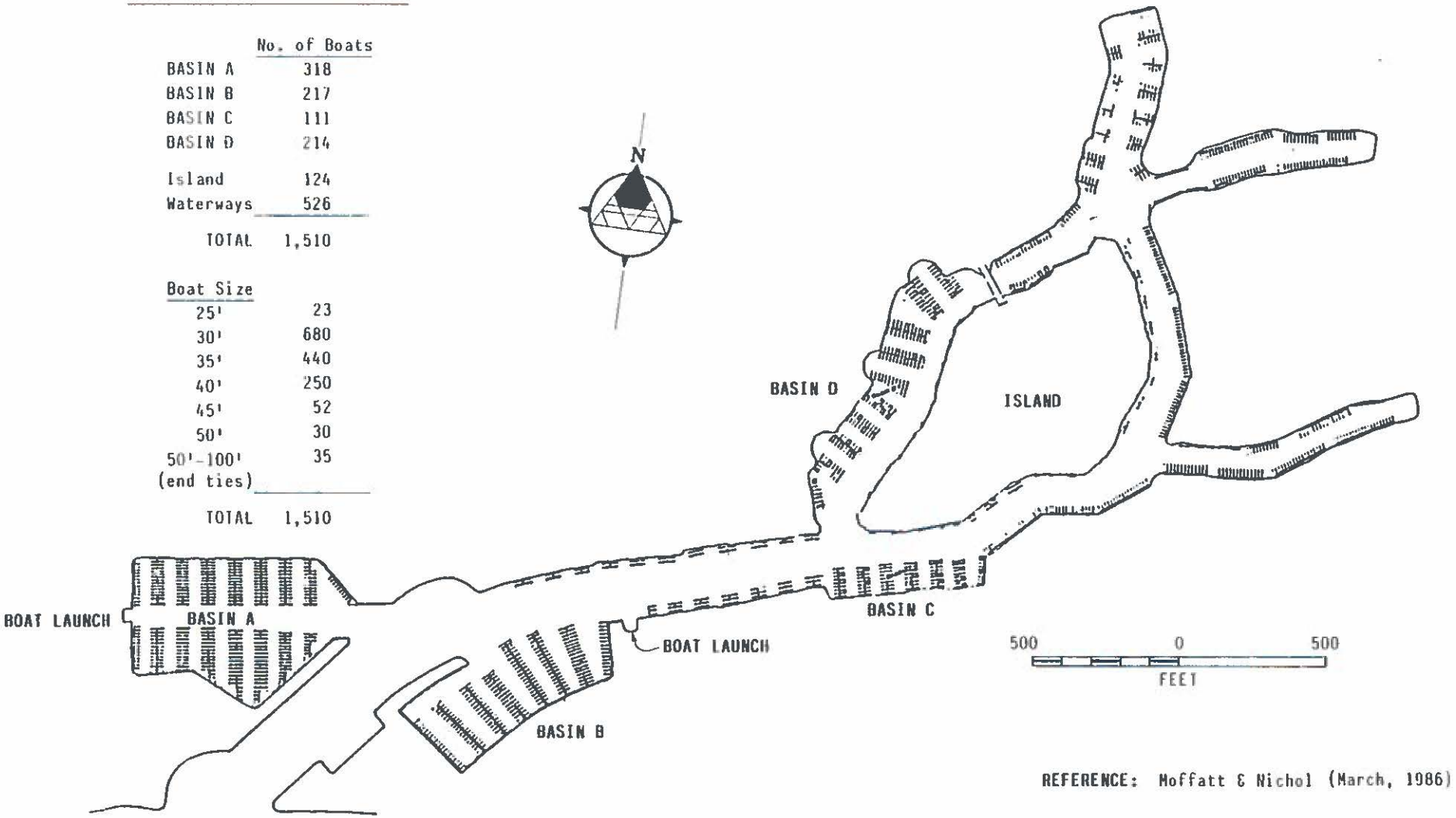
DAMES & MOORE

FIGURE 7

PROPOSED MARINA FLOAT LAYOUT

	No. of Boats
BASIN A	318
BASIN B	217
BASIN C	111
BASIN D	214
Island	124
Waterways	526
TOTAL	1,510

Boat Size	
25'	23
30'	680
35'	440
40'	250
45'	52
50'	30
50'-100' (end ties)	35
TOTAL	1,510



REFERENCE: Moffatt & Nichol (March, 1986)

MARINA BOAT SLIP LAYOUT

WEST ENTRANCE

(FORMERLY ALTERNATIVE 3)

DAMES & MOORE

FIGURE 8

on the coastline. Appendix 2 contains the Moffatt & Nichol report which is summarized below.

The former proposed East Entrance is located at a rocky headland at the west end of Oneula Beach. The proposed West Entrance is located approximately 300 yards west of the East Entrance. Aerial photographs indicate that no beach exists or has existed along the coastline between the rocky headland at Oneula Beach and Nimitz Beach, which is on the NASBP property. Further, no large sand reservoirs have been documented offshore of this reach of shoreline. The primary source of littoral material at Nimitz Beach probably consists of deposits outside of the coral reef and longshore transport appears to be relatively weak. As discussed in the EIS, the primary mode of sand transport at Oneula Beach is onshore and offshore. Long shore transport does not appear to be significant.

Littoral processes in the region are influenced by waves and currents. To study the influence of waves, Moffatt & Nichol performed a wave refraction analysis. The results of their study suggest a convergence of wave energy on the west side of the rocky headland where Oneula Beach generally ends. The convergence of wave energy in this area is also visible on aerial photographs. Their study also suggests that a divergence of wave energy occurs along the shoreline between the headland and Nimitz Beach.

Moffatt & Nichol reviewed available current data and aerial photographs for Oahu and concluded that littoral currents and rip currents contribute to sediment motion and formation of the littoral cell in this area.

According to Moffatt & Nichol, construction of the East Entrance through the Oneula Beach system and the existing reef would probably trap sand. Since littoral transport at this beach system is primarily onshore and offshore, the primary adverse effect of the East Entrance would be the loss of sand from the Oneula Beach system. Some reef material can be expected to fill the proposed channel; however, based on observations at the entrance channels to the Ala Wai canal and Kewalo Basin, maintenance dredging for the proposed East Entrance should be minimal. Groins or jetties could be constructed to prevent sand from entering the channel.

The reach of shoreline in the vicinity of the West Entrance is rocky with little to no sand. Some littoral material may be transported over the rocky shoreline and deposited on Nimitz Beach; however, evidence of significant amounts of sand along this beach has not been documented or witnessed. A small sand trap or groin could be constructed on the east side of the West Entrance to prevent material that is transported along the shoreline from entering the channel.

The West Entrance channel would be located between two surfing sites. Rip currents are found near the boundaries of the surfing sites. Based on a study of Kewalo Basin by Fallon et al. (1971), Moffatt & Nichol also suggest that rip currents should be expected to occur at the West Entrance. The channel would refract waves into the surf sites which would probably enhance wave activity and slightly increase current velocity.

Because the area near the West Entrance does not have sand, the impacts on Oneula Beach should be insignificant. Sand is not suspected of leaving

Oneula Beach to nourish Nimitz Beach, so a channel at this location should have minimal adverse impacts. The West Entrance should also have minimal adverse impact on surfing sites since it is located between sites, as shown on Figure 9. The East Entrance, on the other hand, is located through the middle of a surf site.

D.4 WATER QUALITY ANALYSIS

D.4.1 Introduction

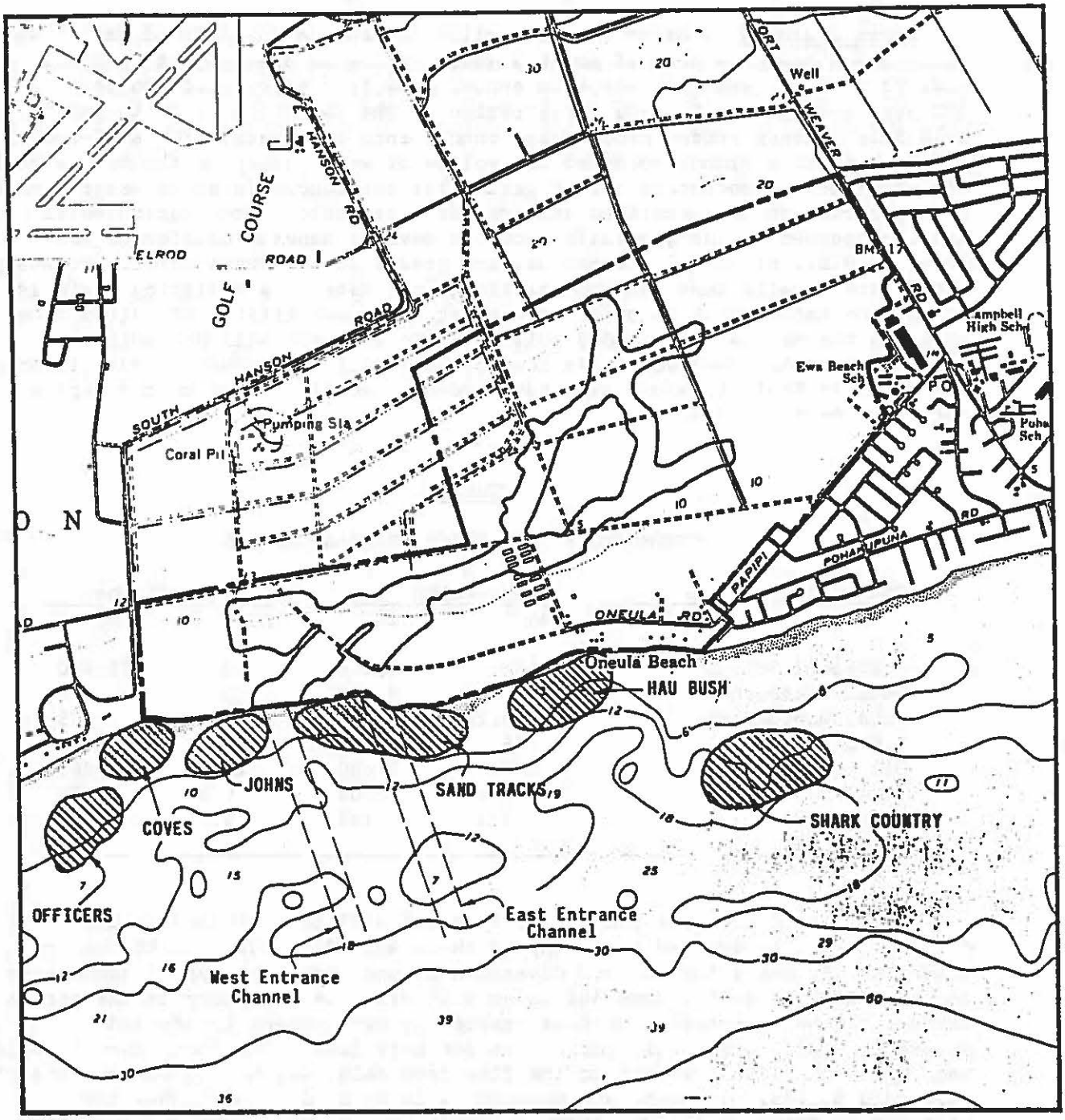
Section 4.2.5 of the Final EIS discusses marina flushing and Section 6.1.2 discusses water quality. Both of these sections refer to the East Entrance Marina Configuration (formerly the proposed configuration). Marina flushing for the West Entrance Configuration (formerly Alternative 3) is also discussed in the Final EIS, Section 4.8.3 (see Appendix 1).

DLU, in their non-acceptance letter, expressed concern "regarding the flushing characterisitics of the marina, the impacts of high-nutrient runoff, the length of residence times, and the consequent potential for poor water quality in the marina." To address these concerns, the applicant further examined the marina water quality for both entrance channel alignments. Moffatt & Nichol, Engineers conducted a water quality analysis and Dr. Jed Hirota of the University of Hawaii provided consultation on the potential impact of high-nutrient runoff. Both of these analyses are presented in Appendix 3. This section of the Addendum summarizes the analyses and supplements the Final EIS.

D.4.2 Water Pollutant Sources

Moffatt & Nichol calculated the prevailing marina water quality by examination of pollutant inputs and by evaluation of tidal flushing and other dispersive mechanisms. They determined that sources of water pollution in the marina originate from boats, storm runoff, and groundwater infiltration.

Boats release exhaust products from engine operation which contribute to water quality degredation. Moffatt & Nichol estimate gasoline consumption within the marina to be 18 gallons per boat per year. Allowances for chemical oxygen demand (C.O.D.) and grease inputs under these conditions are 2 lbs per boat per year and 0.5 lbs. per boat per year, respectively. The antifouling bottom paint used on boats releases copper into the surrounding water at about 2.5 lbs. copper per boat per year. Metal discharges are incorporated into sediments and are subsequently taken up by benthic feeders such as crabs and shellfish. Tidal flushing and other measures to increase water volume turn-over rates do not decrease these concentrations. Heads and galleys can contribute organic matter into the marina; however, as stated in the Final EIS, vessels in Ewa Marina will be prohibited from discharging wastes into the marina and at least one pump-out station will be provided at a convenient location in one or more of the public mooring areas. In addition, Federal Regulations now require marine sanitation devices on all boats equipped with toilets.



Sources:

Unpublished Study, "The Board Surfing Sites Survey", Division of State Parks, Outdoor recreation and historic sites, Dept. Land and Natural Resources.

From copy in Harbors Division, Dept. of Transportation, Original work generated through Dept. Planning and Economic Development 1971 SCORP Studies.

Base Map - U.S.G.S Topographic Map; Ewa, Puuloa, Oahu, Hawaii; 1968.

SURFING SITES

FIGURE 9

Storm drainage is often a major pollution vehicle in enclosed bays. Kaloi Gulch has a drainage area of about 9 square miles at the project boundary. Moffatt & Nichol estimate the mean annual flow from Kaloi Gulch to be 442 acre-feet/year. Because infiltration on the Ewa Plain is quite rapid, only fairly heavy storms produce any runoff into the ocean. For an 8-inch storm, Moffatt & Nichol computed the volume of water reaching the marina to be 360 acre-feet. Concentrations of particular substances in storm water depend on the nature of the watershed and are quite variable. From agricultural land, suspended solids generally occur at several hundred milligrams per liter, C.O.D., nitrogen, phosphorus, and grease are somewhat lower, and heavy metals are usually less than one milligram per liter. A desilting basin is planned on Kaloi Gulch in order to prevent large quantitites of solids from entering the marina. Suspended solids in the effluent will probably not exceed 100 mg/l. Representative concentrations of the important constituents are given in Table 1, along with total quantities discharged to the marina during an 8-inch storm.

TABLE 1

ESTIMATED 8-INCH STORM DRAINAGE INPUTS

Constituent	Kaloi Gulch		Local Drainage	
	mg/l	lb	mg/l	lb
Suspended Solids	100	98,000	750	69,000
Total Nitrogen	6	6,000	2	500
Total Phosphorus	0.25	240	1	275
C.O.D.	25	25,000	50	14,000
Oil	5	5,000	10	2,800
Lead	0.1	100	0.3	80
Zinc	0.1	100	0.3	80

Storm runoff from the project site itself will be collected in pipe drains, but it is assumed that many of these will flow out into the marina channels. Allowing for as much diversion around the waterways as appears to be possible by gravity, some 400 acres will still be tributary to the marina. Because of the impermeable surface created by development (roofs and pavement), more runoff will occur than for bare land. The local runoff would then add about 100 acre-feet to the flow from Kaloi Gulch. Concentrations of suspended solids, nitrogen, and phosphorus in Honolulu runoff have been measured by Fujiwara (1973); these data are applicable to the Ewa community. Rounded off values for suspended solids, nitrogen, and phosphorus are the basis for estimated concentrations given in Table 1.

Groundwater Infiltration. The groundwater at the project site, as detatiled in Chapter E of this Addendum, is too brackish for domestic use, but is extensively used for irrigation. The wells and pits from which irrigation water is pumped extend only a few feet below the water table so as to skim off the relatively fresh water floating on the surface. The water is fairly high in nitrate, which originates as fertilizer applied to the cane fields. Table 2 shows results of groundwater samples taken from irrigation wells north

of the proposed community. Nitrate concentrations average about 7 mg/l and are representative of the current situation in which nearly all of the Ewa Plain is under sugar cane cultivation. These samples represent single well samples taken on one day of the year, and thus need to be interpreted carefully.

TABLE 2

IRRIGATION WELL WATER ANALYSIS

WELL NUMBER D&M	DLNR	PHOSPHATE PO4 (ppb)	CHLORIDE Cl (ppm)	NITRITE N-NO2 (ppb)	NITRATE N-NO3 (ppm)	NITRATE (as N) (ppm)
1		11	1100	87	41	9.3
2	1900-13	14	1020	153	34	7.7
3	2000-01	9	930	87	33	7.5
4	1900-02	24	830	111	34	7.7
5	1900-01	23	920	93	27	6.1
6	1901-01	16	940	105	27	6.1
7	1902-01	20	870	11	26	5.9
Average		17	944	92	32	7.2

*Samples taken January 16, 1986

The daily groundwater flux into the marina would be about 6.5 cubic feet/sec (maximum). Nitrogen and phosphorus inputs would be 245 lb/day and 1 lb/day, respectively.

D.4.3 Marina Flushing

Water quality conditions in the marina channels depend on how fast the various substances present are flushed to sea by tidal and fresh water flows (or removed by some other mechanism). Because of the influx of fresh ground water, it is possible for the marina to become density-stratified. The tendency for stratification is related to the ratio of the volume of fresh water entering the marina during each tide cycle to the volume of salt water in the flood tide. If this ratio is greater than 0.7, stratification will occur while if the ratio is less than 0.1 then the inlet can be considered to be well mixed (Silvester, 1974). A ratio of 0.056 calculated for the entire marina system with the East Entrance location places it in the well-mixed category. Similarly, the ratio for the entire marina system with the West Entrance location as 0.054. Table 3 summarizes the calculated ratios for the individual basins and entire marina systems. Basin G is in the partially mixed regime because of its east-west alignment and its relatively small tidal prism. Determination of the degree of mixing does not take into account windshear driven currents and inter-mixing of the basins. If conditions in the basin are unacceptable, artificial circualtion may be used to improve mixing. Artificial circulation is discussed in Appendix 3.

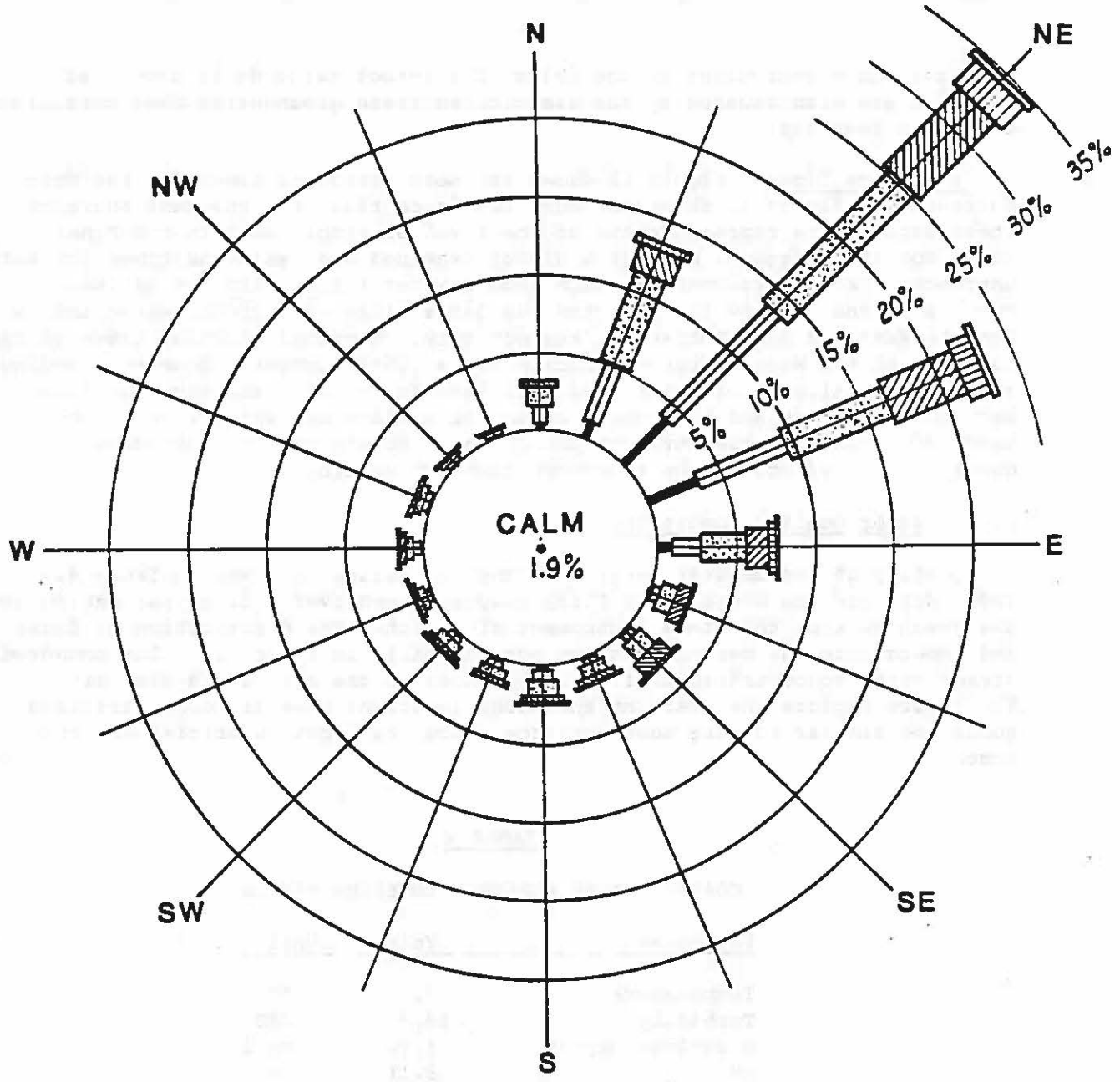
TABLE 3

DEGREE OF MIXING RATIOS

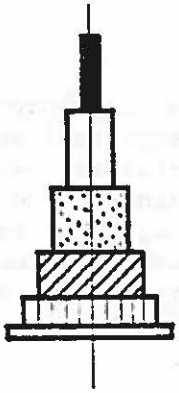
Basin	East Entrance	West Entrance
A	.073	.073
B	.077	.077
C1	.065	.065
C2	.039	.039
D	.062	.062
E	.056	.051
F	.056	.054
G	.194	.194
H	.058	.058
Entire Marina	.056	.054

Additional energy for mixing is available in the form of wind-generated currents. A wind rose from records compiled at the Barbers Point Naval Air Station is shown in Figure 10. Most of the channel system for both the East and West Entrances is aligned more or less parallel to the prevailing trade wind from the northeast. Mixing will occur whenever the fresh water velocity exceeds 0.15 ft/sec. The surface velocity has been estimated at 2 to 3 percent of the wind velocity (Wu, 1969). Using a conservative value of 2 percent yields a necessary wind speed of 4.4 knots to generate mixing. Due to the alignment of the marina channels with the trade winds, the minimum wind velocity is present approximately 70 percent of the time. Thus, no part of either marina should experience extreme stratification, although the surface water will be somewhat less saline than that at the bottom.

Marina channels B, C, D, and E are aligned in the direction of the prevailing trade wind and will experience a longitudinal circulation current. Using an average wind speed of 8 knots from the wind data at Barbers Point, Moffatt & Nichol estimated a wind-induced current on the order of 100 cubic feet/sec; which results in the entire channel section circulating in less than one day. This time period is quite short relative to tidal exchange times throughout the system, and the east-west channel can be considered perfectly mixed. The three north-south channels, A, G, and H, are considered to disperse longitudinally as a diffusion process, using an effective diffusion coefficient of 6 square feet/sec. The remaining channels experience tidal



WIND SPEED (KNOTS)



PERIOD OF RECORD
1949-1972

SOURCE
BARBERS POINT NAVAL AIR STATION
STATION 22514

WIND ROSE FOR BARBERS POINT NAVAL AIR STATION

REFERENCE: Moffatt & Nichol (March, 1986)

DAMES & MOORE
FIGURE 10

exchange flows equivalent to the prism of a 1-foot twice-daily tide. All channels are also flushed by the distributed fresh groundwater flow totalling 6.5 cubic feet/sec.

Residence Times. Figure 11 shows the mean residence times for the West Entrance and Figure 12 shows the mean residence times for the East Entrance. These figures are representative of the level of effort used in the Final EIS. For the Addendum, Moffatt & Nichol examined the residence times for both entrances taking into consideration ground-water inflow into the marina. Figures 13 and 14 show the computed residence times with ground-water inflow for the West and East Entrances, respectively. Computed flushing times in the layout with the West Entrance location are slightly longer. However, keeping the entrance aligned with the wind will tend to increase the exchange flow between the marina and the ocean, since the surface current driven by the trade wind can continue straight out to sea. No attempt has been made to quantify this effect in the residence time calculations.

D.4.4 Water Quality Conditions

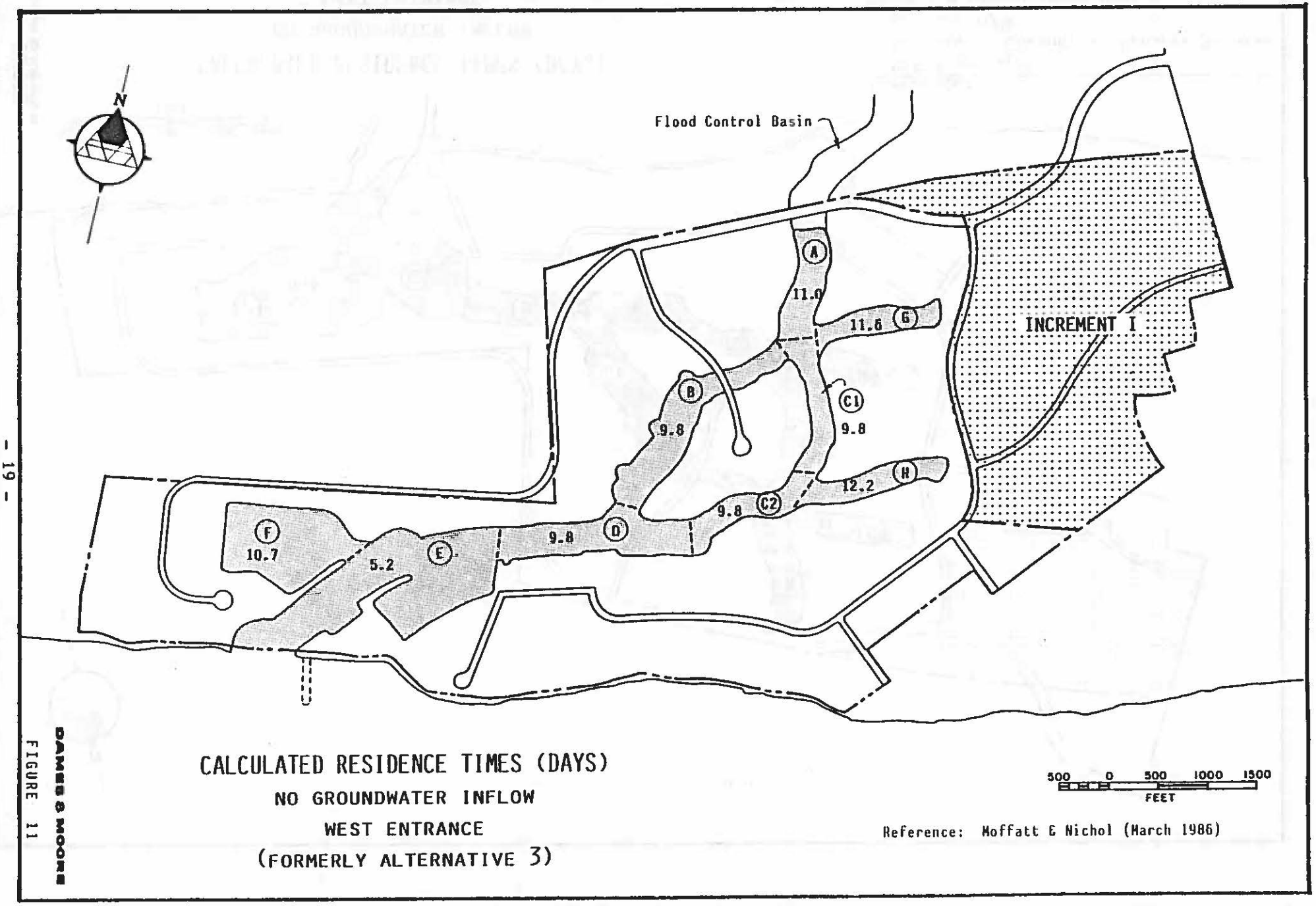
Quality of the coastal water entering the marina is given in Table 4. These data are the averages of forty samples taken over a five-year period at Ewa Beach Park by the State Department of Health. The distribution of flows and inputs into the marina is shown schematically in Figure 15. The computed steady state concentrations of the substances in the marina are also given. The figure depicts the West Entrance configuration; however, concentrations should be similar for the East Entrance since the input quantities are the same.

TABLE 4

COASTAL WATER ANALYSIS ENTERING MARINA

Parameter	Value	Unit
Temperature	25.7	°C
Turbidity	19.9	JTU
Dissolved Oxygen	6.70	mg/l
pH	8.11	-
Salinity	33.1	ppth
Total Nitrogen	0.28	mg/l
Total Phosphorus	0.05	mg/l

Total nitrogen in the marina reaches nearly 1.5 mg/l while phosphorus remains the same as the ocean background; organic matter expressed as C.O.D. is negligible everywhere. Copper ranges from 20 to 90 micrograms per liter. These values depend on the assumption that hydraulic flushing is the only removal mechanism, and should therefore be conservative. Salinity in the upper channels is reduced to 90% that of the ocean as a result of the groundwater inflow. Mixing action by wind and current action is likely to be sluggish in the three finger channels (A, G, and H), so that they may become somewhat stratified, with lower salinity near the surface.



CALCULATED RESIDENCE TIMES (DAYS)

NO GROUNDWATER INFLOW

WEST ENTRANCE

(FORMERLY ALTERNATIVE 3)

Reference: Moffatt & Nichol (March 1986)

FIGURE 11

DAMES & MOORE

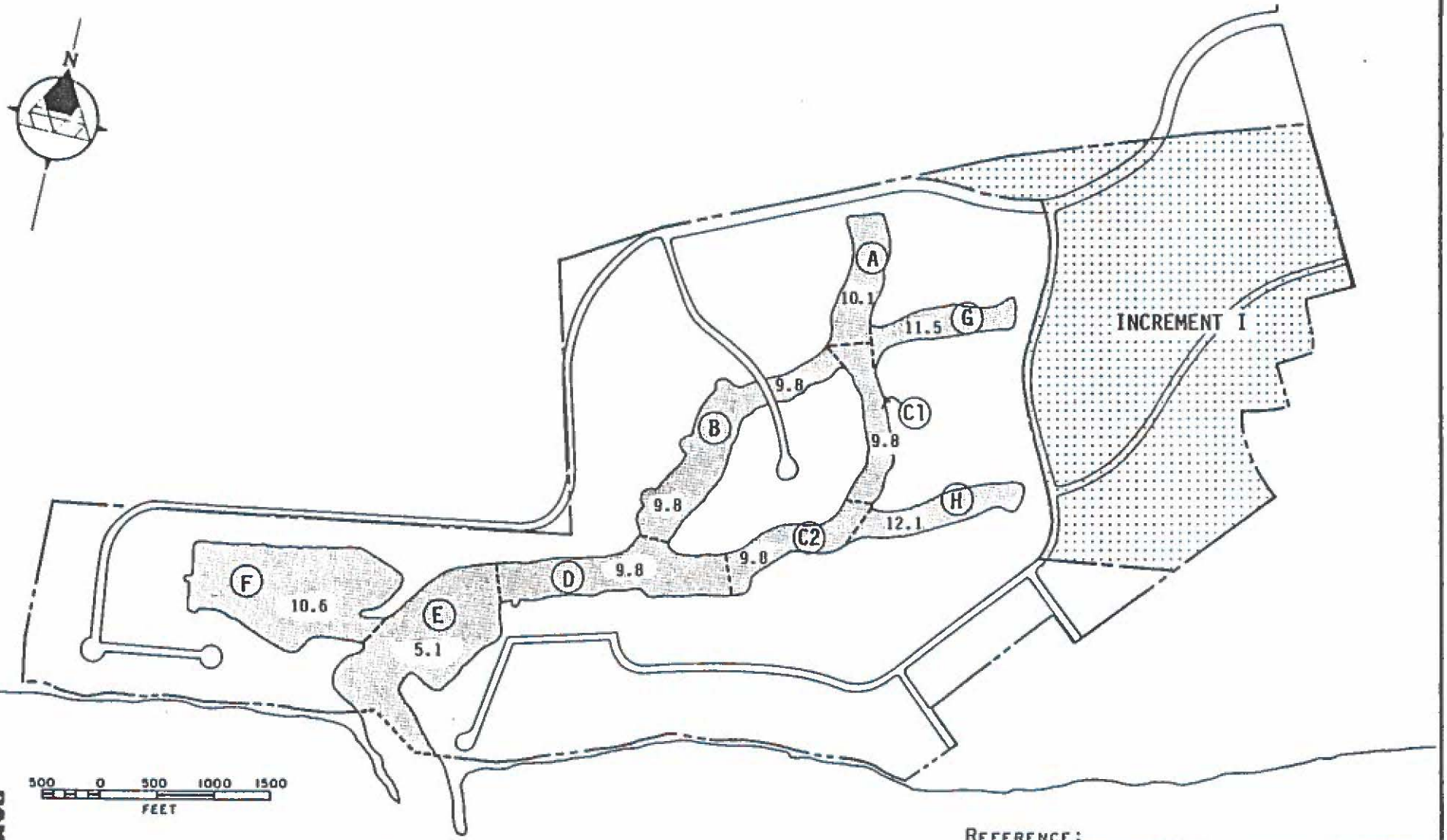


FIGURE 12

CALCULATED RESIDENCE TIMES (DAYS)

NO GROUNDWATER INFLOW

EAST ENTRANCE

(FORMERLY PROPOSED ALTERNATIVE)

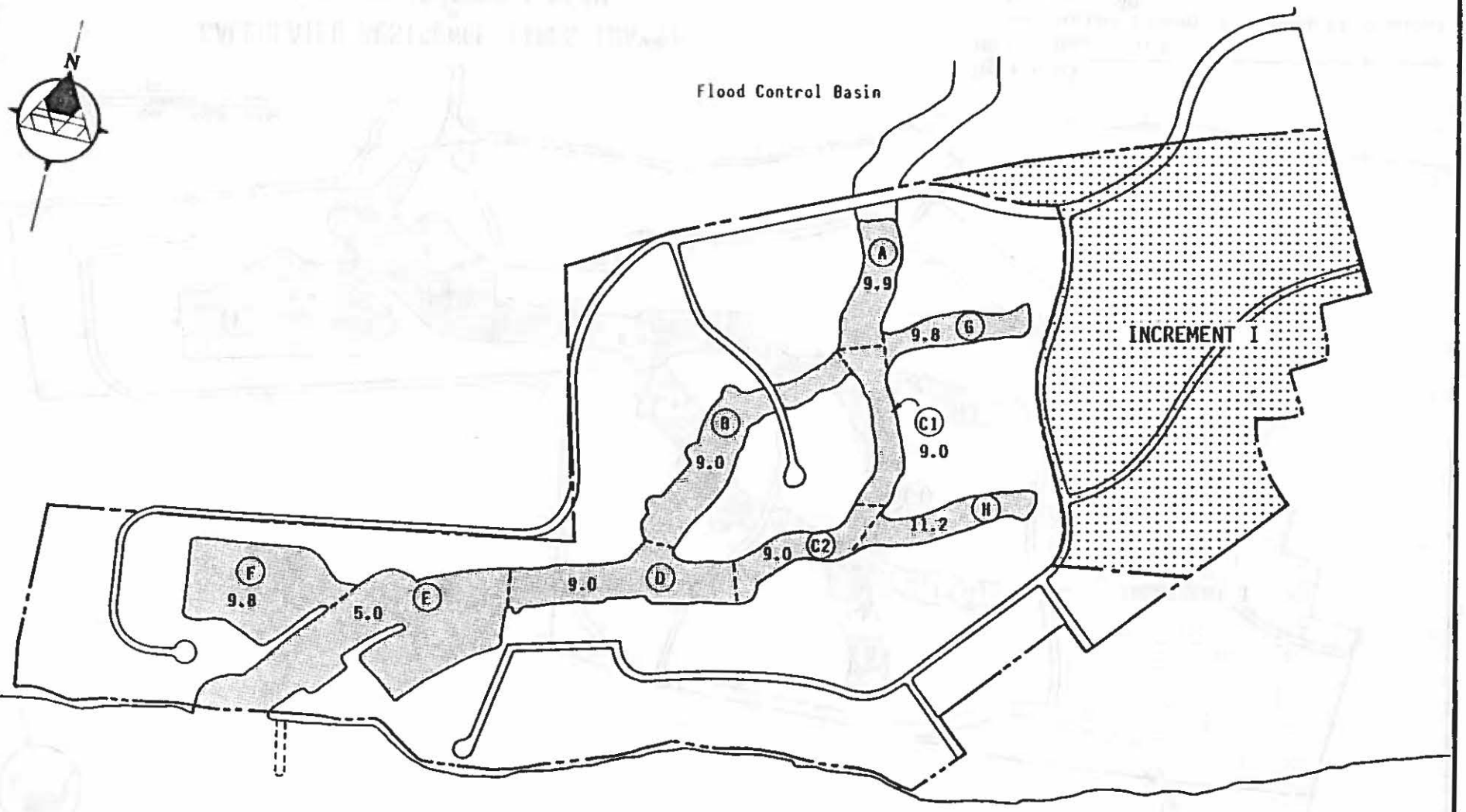
REFERENCE:

MCM & ASSOCIATES

EWA MARINA COMMUNITY, PROJECT SUMMARY

JANUARY 1981

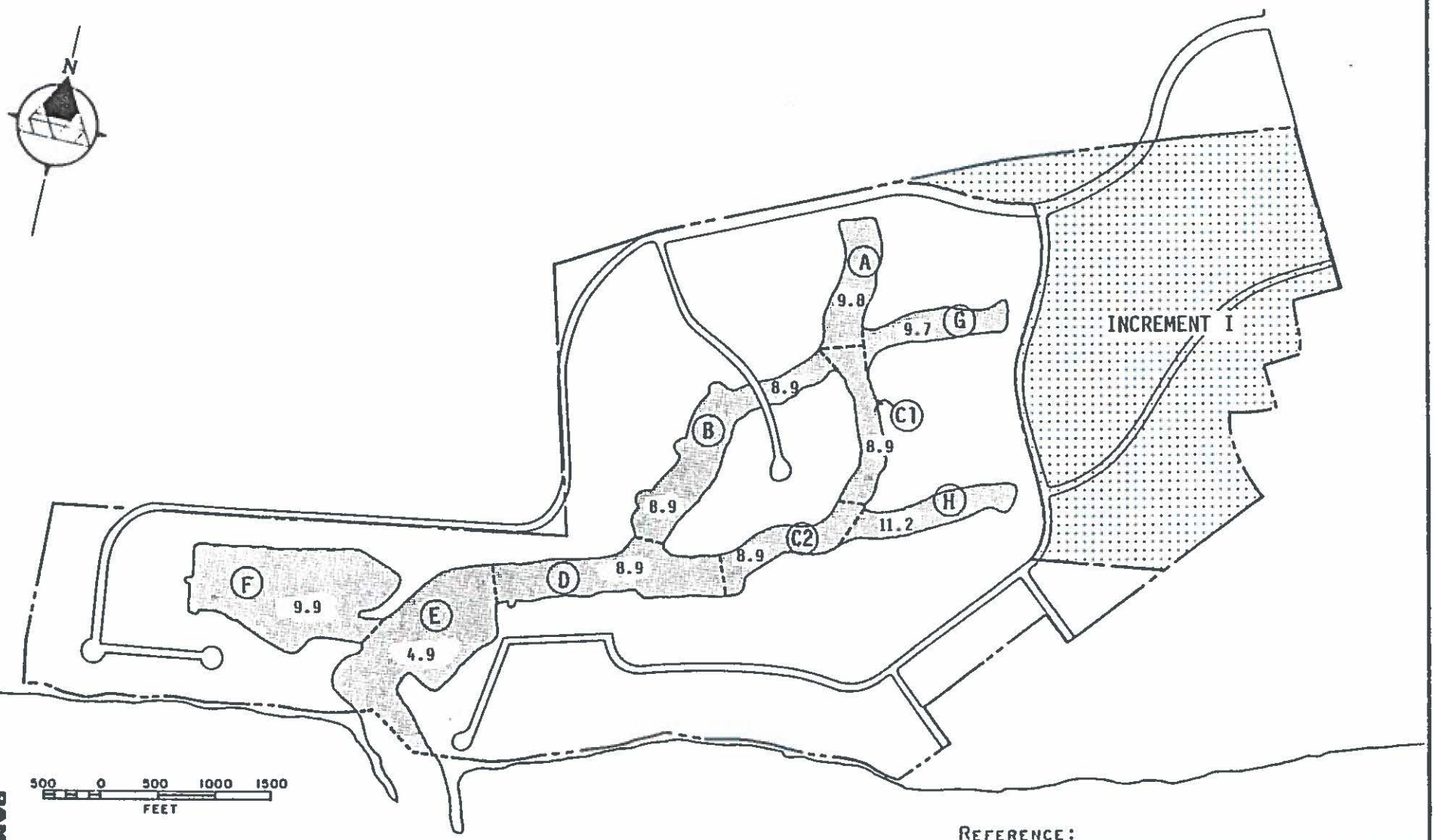
MOFFATT & NICHOL (March 1986)



CALCULATED RESIDENCE TIMES (DAYS)
WITH GROUNDWATER INFLOW
WEST ENTRANCE
(FORMERLY ALTERNATIVE 3)

Reference: Moffatt & Nichol (March 1986)

DAMES & MOORE
FIGURE 13



CALCULATED RESIDENCE TIMES (DAYS)
WITH GROUNDWATER INFLOW
EAST ENTRANCE
(FORMERLY PROPOSED ALTERNATIVE)

REFERENCE:
MSM & ASSOCIATES
EWA MARINA COMMUNITY, PROJECT SUMMARY
JANUARY 1984
MOFFATT & NICHOL (March 1986)

DAMES & MOORE
FIGURE 14

With the passage of severe rainstorms, the large volumes of runoff will completely override normal water quality conditions. Using the example of an 8-inch storm described earlier, the total runoff volume would be about half the total marina volume. Accordingly, the series of cannels which receive the flow from Kaloi Gulch will become largely displaced by fresh water. In effect, the channel will become the estuary of a river whose velocity may exceed one knot, depending on the storage volume provided in the desilting basin. Concentrations will range from the values given in Table 1 down to a small fraction of these values near the entrance. Runoff will cease soon after it stops raining, and the water will gradually revert to normal; the time required will be on the order of the mean residence times given in Figure 15.

Effects of the marina development on ocean water quality will be small, and in some respects, beneficial. All of the nitrogen carried into the marina with the groundwater flow is reaching the ocean directly at the present time. Storm runoff to the ocean will increase somewhat because of the development's impervious surfaces, but the amount of silt and nutrients will be reduced by sedimentation in the Kaloi Gulch desilting basin and in the marina itself.

D.4.5 Water Quality Standards

State water quality standards are given in Title 11, Chapter 54, Water Quality Statndards (April 1984). They include basic criteria applicable to all waters, and also more specific criteria for several types of marine and inland water bodies. The basic section provides that all waters shall be free of the following substances attributable to controllable pollution sources:

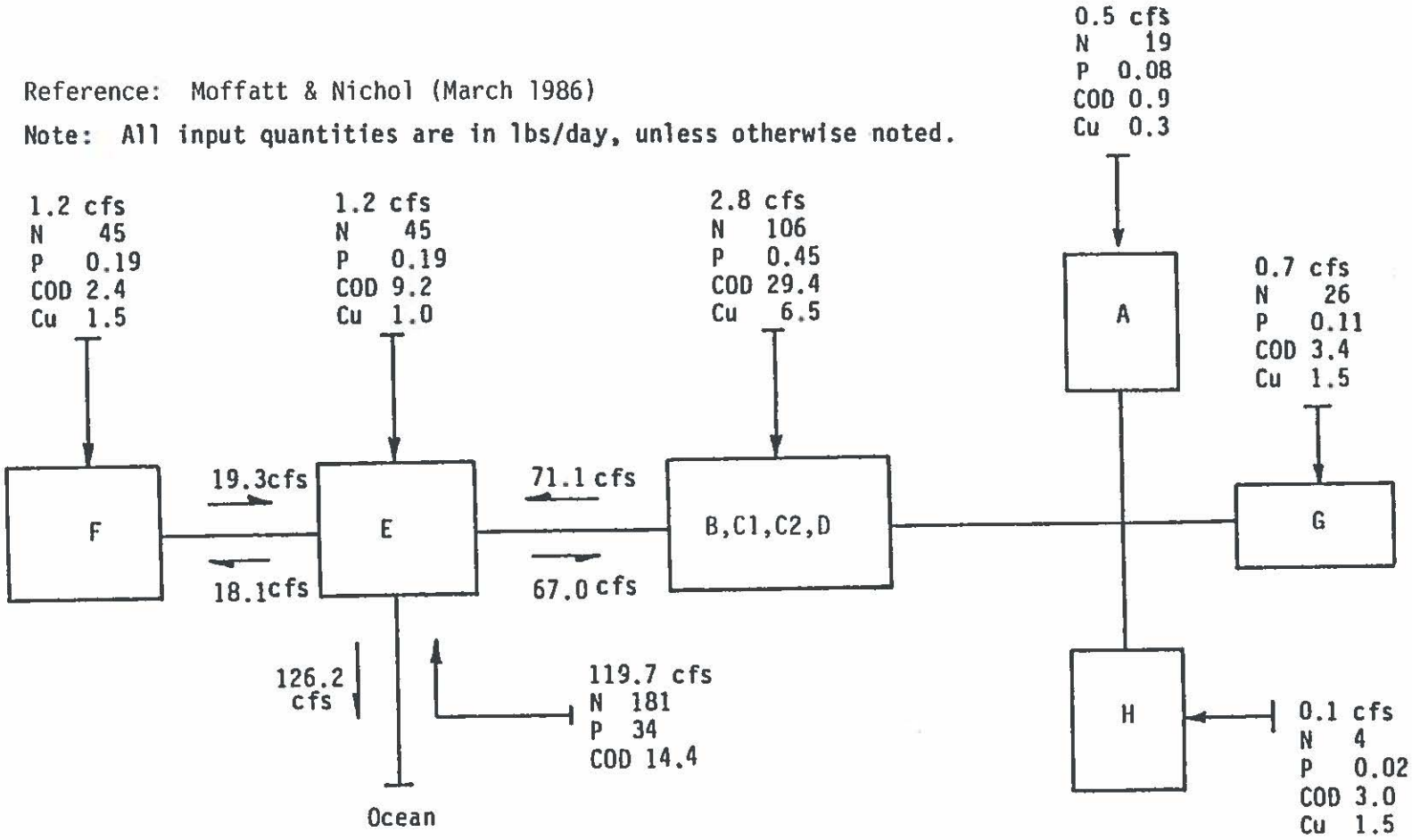
(A) Materials forming objectional bottom deposits.
(B) Floating materials such as debris, oil, and scum.
(C) Substances producing objectionable color or turbidity in the receiving water or tastes in the flesh of fish.
(D) High temperature, pathogenic organisms, and materials in quantities harmful to human, animal, plant, or aquatic life.
(E) Substances producing undesirable aquatic life.
(F) Soil particles eroded from disturbed land areas.

One of the types of marine waters for which specific criteria have been set up are embayments. On Oahu, the specific rules are applicable to the Ala Wai Boat Harbor, Kewalo Basin, Keehi Lagoon, Barbers Point Harbor, and several others. Embayments are designated as "wet" if the average daily fresh water inflow equals or exceeds 1 percent of the bay volume per day. Different numerical limits are provided for wet and dry embayments. Table 5 lists the regulated parameters and their limits. As a public water body, all or part of the Ewa Marina might be placed in the group of harbors subject to the limits of Table 5. The "wet" criteria will apply since the daily groundwater inflow will be greater than 1 percent of the marina volume.

It is unlikely that Ewa Marina will meet State Water Quality Standards for Marine Embayments for all criteria because of two major factors:

Reference: Moffatt & Nichol (March 1986)

Note: All input quantities are in lbs/day, unless otherwise noted.



Resulting Concentrations

Point	N mg/l	P mg/l	COD mg/l	Cu ug/l	Salt %Sea	Res. Time days
E	0.56	.05	.07	20	95	5.0
F	0.96	.05	.09	30	89	9.8
B,C1,C2,D	0.93	.05	.16	40	89	9.0
A	1.14	.05	.17	40	86	9.9
G	1.45	.05	.23	70	82	9.8
H	1.03	.05	.25	90	88	11.2

SCHEMATIC OF FULL MARINA WITH GROUNDWATER INFLOW

WEST ENTRANCE

(FORMERLY ALTERNATIVE 3)

FIGURE 15

DAMES & MOORE

TABLE 5

WATER QUALITY LIMITS FOR MARINE EMBAYMENTS

Parameter	Geometric mean not to exceed the given value	Not to exceed the given value more than 10% of the time	Not to exceed the given value
Total Kjeldahl Nitrogen (ug N/1)	200.00* 150.00**	350.00* 250.00**	500.00* 350.00**
Ammonia Nitrogen (ug NH_4-N/1)	6.00* 3.50**	13.00* 8.50**	20.00* 15.00**
Nitrate & Nitrite Nitrogen (ug[NO_3+NO_2]-N/1)	8.00* 5.00**	20.00* 14.00**	35.00* 25.00**
Orthophosphate Phosphorus (ug PO_4-P/1)	10.00* 7.00**	25.00* 12.00**	40.00* 17.00**
Total Phosphorus (ug P/1)	25.00* 20.00**	50.00* 40.00**	75.00* 60.00**
Light Extinction Coefficient (k units)	0.40* 0.15**	0.80* 0.35**	1.20* 0.60**
Chlorophyll a (ug/1)	1.50* 0.50**	4.50* 1.50**	8.50* 3.00**
Turbidity (Nephelometric Turbidity Units	1.50* 0.40**	3.00* 1.00**	5.00* 1.50**
Nonfilterable Residue (mg/1)	25.0* 15.0**	40.0* 25.0**	50.0* 35.0**

*"Wet" criteria apply when the average fresh water inflow from the land equals or exceeds 1% of the embayment volume per day.

**"Dry" criteria apply when the average fresh water inflow from the land is less than 1% of the embayment volume per day.

Applicable to both "wet" and "dry" conditions:

pH Units shall not deviate more than 0.5 units from a value of 8.1.

Dissolved Oxygen - Not less than 75% saturation.

Temperature - Shall not vary more than 1°C from ambient conditions.

Salinity - Shall not vary more than 10% from natural or seasonal changes considering hydrologic input and oceanographic factors.

1. Marine, coastal water quality values monitored at Ewa Beach Park (Table 6) show levels of total nitrogen (TN) and total phosphorus (TP) that already exceed State Water Quality Standards; these data suggest, but do not prove, that the Ewa Plain groundwater already has an effect of enrichment on the coastal zone through diffuse inputs. These coastal waters are the "source" waters for the Ewa Marina and now contain various nutrient and particulate levels which shall characterize waters for the new marina. Since these waters are already at or in excess of some water quality limits, it would seem unreasonable to expect that the marina waters would be significantly better.

2. Groundwater influx to the dredged marina amounts to some 6.5 ft^3/sec, or about 1.15% of its estimated volume of 48,787,200 ft^3. This groundwater has high levels of nitrate (7.2 mg/l) and total nitrogen (14 - 20 mg/l), which when added to the relatively rich coastal water, would exceed the limits for TN and probably for TP as well, although to a much lesser extent. Because diffuse-source groundwater inputs to the coastal waters are presumably already occurring, construction of the Ewa Marina would simply modify locations of the input source rather than cause major changes in water quality.

Fortunately, the phosphorus content (as phosphate) of the groundwater and the marine coastal waters at Ewa Beach is much less by mass and relative atomic abundance than nitrate and total nitrogen (See Appendix 3). Thus, whereas dissolved nitrogen as nitrate and dissolved organic nitrogen (DON) may exceed the State Water Quality Limits, it appears that phosphorus will be much lower, closer to compliance, and will be the limiting micro-nutrient for plant cell growth. While there is some reason for concern that the groundwater leakage into the marina shall boost total nitrogen levels above the State Water Quality Limits for marine embayments, it is not expected to result in pollution sources of "undesirable aquatic life" or cause "objectionable color or turbidity". The reasons that these pollutant effects are unlikely in this specific case are summarized as follows:

1. The limiting micro-nutrient for plant growth in the marina water will be phosphorus, and its levels in the groundwater aquifer show that most of the nitrate will not be available or converted to plant biomass because of this phosphorus limitation.

2. The physical characteristics of the marina--shallow depth of about 10 ft. on average, orientation parallel to the prevailing tradewinds, non-stratified salinity and density conditions generally, and high exchange rates (9 to 20% daily exchange or 5 to 11 days residence times, assuming complete wind and tidal mixing) -- are a significant physical dispersal mechanism to the groundwater nutrient loading.

3. Accumulated biomass from algal growth in marina waters from the groundwater nutrient loading will be partly controlled by populations of particle-grazing zooplankton and benthic animals such as sponges, tunicates, barnacles etc.; however, it is not possible to quantitatively predict how much biotic control can be exerted relative to physical dispersal. Since the marina is so shallow and expected to be very well mixed vertically, no net sinking losses from the system are anticipated.

In the worst case scenario for rather brief durations (few days to perhaps a week), one could expect that during severe rainstorms with calm winds, which would allow stratification of marina water and inject heavy silt loads, algal blooms could occur in the most poorly flushed inner basins (areas A, G, H). However, a return to "normal" tradewind and tidal flushing conditions should enable adequate dispersal of any algal blooms to conditions like coastal waters.

D.5 ANALYSIS OF TSUNAMI EFFECTS

The Final EIS described tsunamis and tsunami hazards in Sections 5.8.2 and 6.1.4, respectively. The University of Hawaii, Environmental Center commented on tsunamis in a letter to Dames and Moore dated February 10, 1986, which is presented in Chapter G of this Addendum. This section of the Addendum, D.4, considers the Environmental Center's comments and presents the effect of tsunmai inundation on both the East and West Entrances.

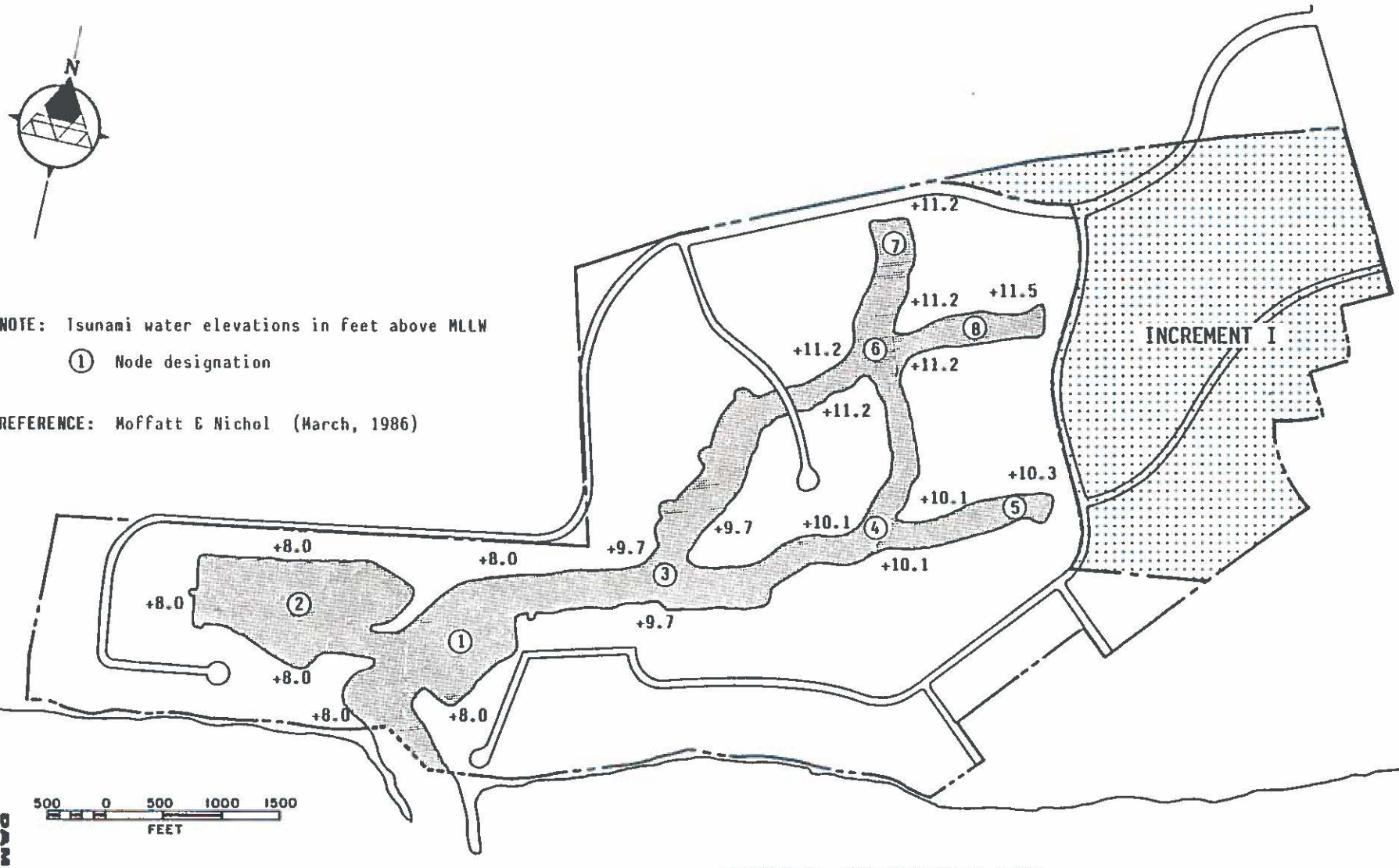
Past tsunamis, such as those mentioned in the Final EIS, appeared as a rapid rise and fall of sea level. An urbanized area located close to the shore could therefore suffer damage due to inundation, but probably not structural failures caused by impact forces.

For most of the coastline, including the Ewa area, the controlling criterion is a tsunami event of a 100-year return period. The maximum run up elevation for this event does not exceed +9 feet mean lower low water (MLLW) along the existing coastline. (All elevations in this section refer to MLLW datum). However, resonance characterisitics of the proposed marina waterways may tend to amplify water level fluctuations near the ends of the marina channels. Resonance occurs when the frequency of the tsunami corresponds to the natural frequencies of the channels which results in higher run ups.

Numerical computations to estimate the maximum run up elevations in the marina channels for both East and West Entrances were made by Moffatt & Nichol using a link-node hydrodynamic model. The friction or roughness coefficient (Mannings "n") for all of the channels excavated in coral was taken as 0.030, which is considered a conservative value for the proposed Ewa Marina channels and may take into account future siltation that would make the channel bed less rough.

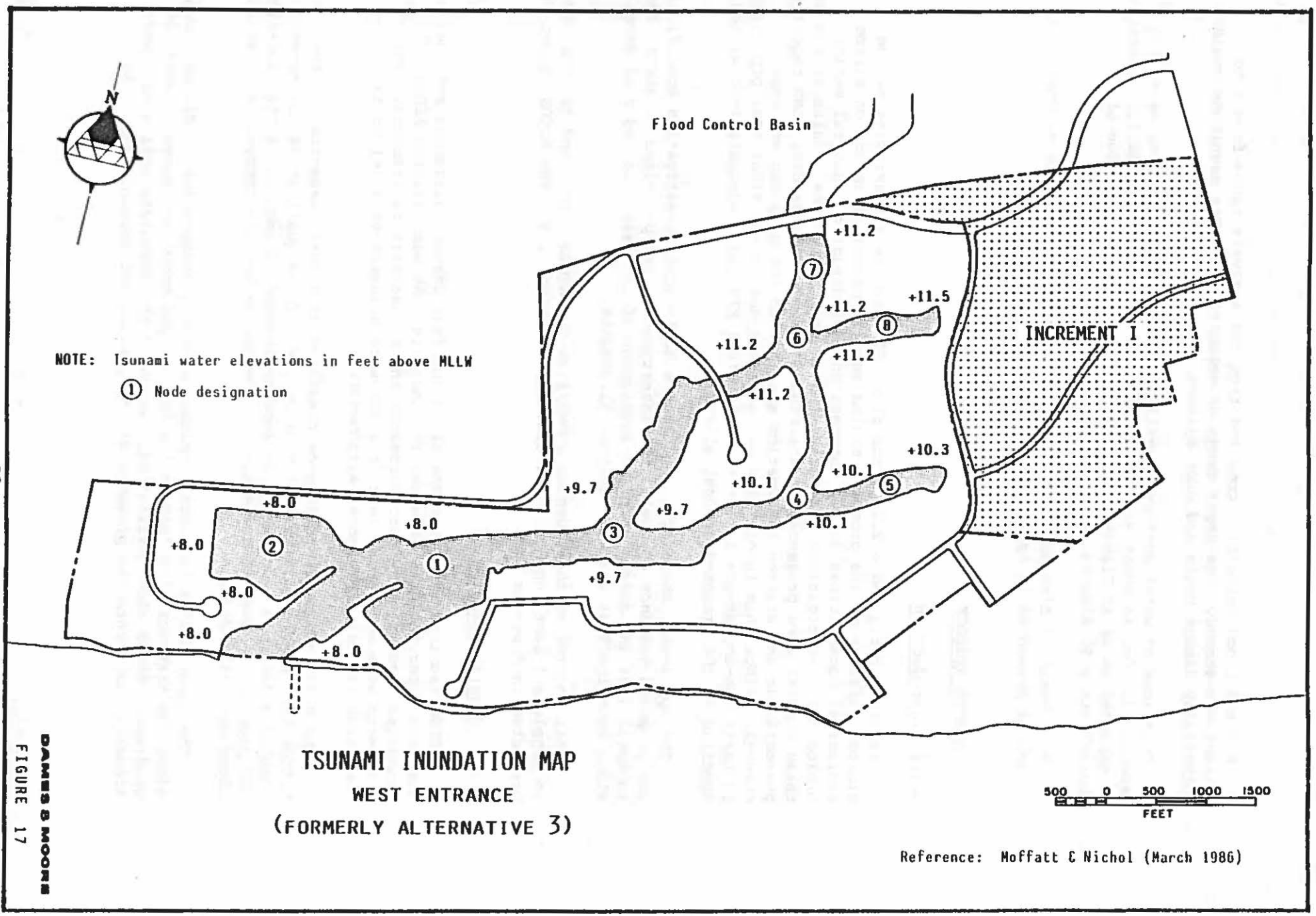
The forcing function used at the marina entrance was the tide gage record from Honolulu Harbor during the 1960 tsunami, which produced a maximum water elevation at that location of Elevation +4.1 feet. The run up during the 1960 tsunami at Honolulu Harbor was Elevation +5 feet, and at Ewa Beach was Elevation +9 feet. Therefore, the run up elevation at Ewa Beach was amplified by a factor of 1.8. This factor was applied directly to the forcing function used in this analysis.

The results of the numerical computation are shown on Figure 16 for the East Entrance and on Figure 17 for the West Entrance. Maximum water elevations within the marina during an occurrence of a tsunami of similar magnitude to the 1960 event are shown on these figures. The maximum water elevation calculated for both entrance schemes is +11.5 feet at the upper end of the marina.



TSUNAMI INUNDATION MAP
EAST ENTRANCE
(FORMERLY PROPOSED ALTERNATIVE)

DAMES & MOORE
FIGURE 16



TSUNAMI INUNDATION MAP

WEST ENTRANCE

(FORMERLY ALTERNATIVE 3)

Reference: Moffatt & Nichol (March 1986)

DAMES & MOORE

FIGURE 17

Ebb and flood velocities computed from the analysis range from 0 to 11 feet per second. The upper range of velocities of this magnitude could potentially damage boats and dock systems.

Durations of water surface elevations above given elevations were also determined. For an event similar to the 1960 tsunami, water surface elevation is expected to be at Elavation +10 feet or higher for a duration of approximately 50 minutes.

More detailed discussion of the numerical computation made by Moffatt & Nichol is presented in Appendix 4.

D.6 MARINE BIOLOGY

D.6.1 Introduction

Sections 5.8.1 and 6.2.2 of the Final EIS discuss the existing marine biology offshore of the proposed marina and the potential impact on marine biological communitites due to entrance channel dredging. Several marine biological investigations were conducted in this area. The results of two of these studies were presented in the EIS. In review of the EIS, DLNR requested photographic and written information specific to the proposed entrance channel. Since this information was not included in the Final EIS, DLU stated in their non-acceptance letter that the Final EIS lacks adequate information specific to the proposed channel alignment.

The applicant, therefore, conducted a biological investigation specific to the proposed entrance channel. The investigation was performed by AECOS, Inc. in April 1986 and consisted of an assessment of the reef flat and reef margin along both the East and West Channel Alignments.

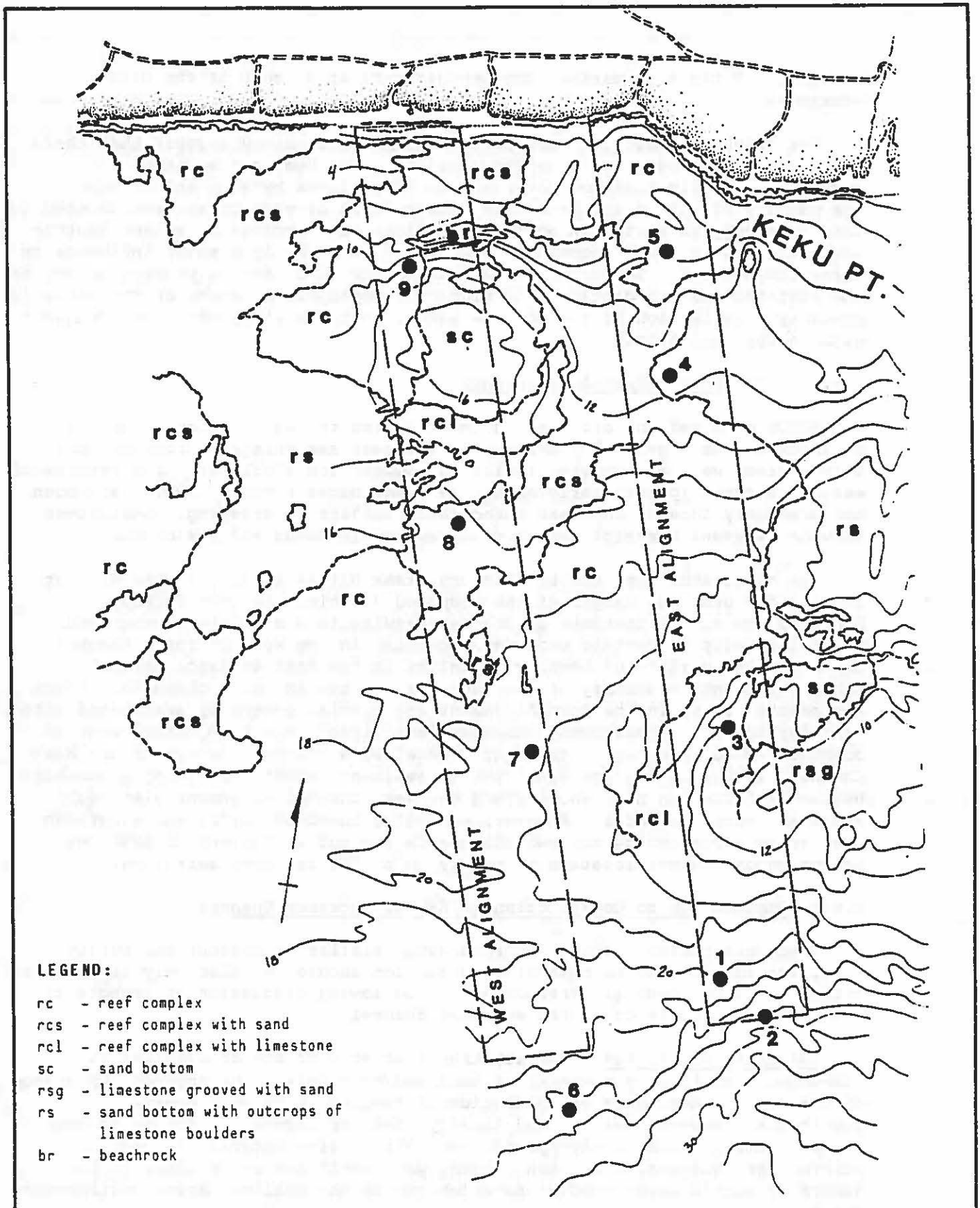
This chapter of the Addendum summarizes the AECOS report and is intended to supplement Sections 5.8.1 and 6.2.2 of the Final EIS. The AECOS report is presented in Appendix 5.

D.6.2 General Description

AECOS examined five stations along the East Channel Alignment and four stations along the West as shown in Figure 18. At each station AECOS conducted a qualitative reconnaissance and a quantitative transect. The transects were each 65.62 feet long and were oriented parallel to the shoreline (across the channel alignment).

The qualitative reconnaissance consisted of visual inspection of the bottom type and benthic community structure. These qualitative assessments enabled a determination of the representativeness of each transected location, and provided an overall assessment of the marine benthic communities present along each alignment.

The quantitative transects included a visual enumeration of fishes, counts along the transect line laid on the bottom, and cover estimates in benthic quadrats. AECOS also qualitatively surveyed the immediate area around each transect to record the presence of any species not encountered in the



AECOS SURVEY STATION LOCATIONS

Reference: AECOS 1986

DAMES & MOORE
FIGURE 18

transect. Table 6 summarizes the benthic habitat at each of the nine stations.

The results of earlier surveys and the present survey suggest that there are some common features among the stations. The dominant substratum component is solid limestone overlain in many places by sand and/or rubble. The paucity of corals and prostrate growth forms of most corals encountered in this area suggest that high energy conditions must impinge on extant benthic communities with some frequency. Storm surf is probably a major influence on these communities. The diversity and abundance of organisms present at any of the stations was not particularly high; the depauperate nature of the biota is probably a reflection of the shallow water, unstable silty-sand, and frequent high energy conditions.

D.6.3 Alternative Channel Alignments

AECOS examined the biota along the East and the West Entrance Channel Alignments. As a general observation, the reef assemblages throughout the survey areas were remarkably similar in composition (Table 6). The results of earlier surveys (particularly AECOS, 1980 and Dames & Moore, 1985), although not precisely located in areas potentially subject to dredging, nonetheless provide relevant descriptions of this reef environment and its biota.

The substratum type and benthic organisms differ locally (Table 6), but differences over the length of the proposed dredging are less marked. Grouping the survey stations by channel results in a slightly greater mean overall density of benthic organisms (corals) in the West Entrance Channel, and a greater variety of benthic organisms in the East Entrance Channel. Table 7 presents a summary of the biota of the two entrance channels. Since the benthic biota in the East Alignment are species generally associated with more turbid water conditions, somewhat less direct impact to extant benthic communities would occur if the East Channel were dredged instead of the West Channel, as the corals are sensitive to sediment impact. Avoiding a submerged beachrock formation near shore along the West Channel Alignment also would minimize benthic impacts. However, according to AECOS, differences between reef areas representing the two alignments are not sufficient to base the selection of channel location primarily on biological considerations.

D.6.4 Impacts Due to Construction of Either Entrance Channel

Since the benthic habitat is remarkably similar throughout the survey area, the impacts due to channel construction should be relatively similar for either entrance channel. Therefore, the following discussion of impacts is generally applicable to either entrance channel.

Impact on Substratum. The substratum at most of the study sites is limestone, overlain by a veneer of sand and/or rubble. The scoured appearance of much of the bottom is an indication of frequent high wave energy conditions. However, silty-sand lightly coats or covers the bottom in most areas. Some of this thinly-spread reservoir of fine material is readily stirred into suspension by each passing wave swell and contributes to the generally turbid water conditions which typify the shallow marine environment off Ewa.

TABLE 6

SUMMARY OF BENTHIC HABITAT AT EACH OF THE NINE STATIONS IN THE EAST AND WEST CHANNEL ALIGNMENTS

STATIONS / DISCRIPTIONS	EAST CHANNEL ALIGNMENT 1	2	3	4	5	SUM	WEST CHANNEL ALIGNMENT 6	7	8	9	SUM
PHYSICAL											
Distance from shore (ft)	2600	2600	2100	800	200		3600	2200	1400	400	
Water depth (ft)	18-22	25	6-8	8-10	5-6		22-26	12-15	10-15	2-8	
Substrate	A	B	C	D	E		B	F	G	H	
Slope	low	flat	1-3'	1-2'	varia		low	low	low	varia	
Dominant organism	sp/an	coral	sparce	algae	al/urc		coral	urchin	algae	algae	
FAUNAL											
Coelenterata (Holothera)											
Actinopyge mauritiana					*	*				(1)	(1)
Holothuria atra			(2)	(7)	(26)	(35)		(1)	(2)	(1)	(4)
(Anemones)											
Aiptasia pulchella	*			*		*	*				*
Aiptasia sp.	*					*					
(Corals)											
Montipora patula							*	*			*
Palythoa tuberculosa	*	*		*		*	*	*	*		*
Pavona variana							*			*	*
Pocillopora meandrina	1	1	1	*		1	*	1	*	*	1
P. molokensis				3		3					
Porites compressa		1		*		*		2			2
P. evermanni		2	1			2	*	1		*	1
P. lobata	3	20	3	3		29	15	20	1	2	37
Porifera (Sponges)											
Iotrochota protea	1			3		4	1	*			1
Echinodermata (Urchins)											
Echinometra mathaei	(31)	(61)	(5)	(46)		(143)	(43)	(79)			(122)
Echinostrephus aciculatum	(4)				(4)	(7)				(7)	
Echinothrix diadema			(18)			(18)		(1)	*		(1)
Tripneustes gratilla	(6)	(1)	(1)	(16)	(2)	(26)	(3)	(48)	(1)		(52)
Mollusca (Snails)											
Conus distans			*	*		*					
C. leopardus	*			*		*	*				*
C. lividus			(1)		(1)	(2)		(1)	(1)	(1)	(3)
(Mussels)											
Brachidontes crebristriatus				200/100 cm^2	*	200/100 cm^2			70/100 cm^2	*	70/100 cm^2
(Octopus)											
Octopus cyanea			*			*		*	*	(1)	(1)
Arthropoda											
Charybdis orientalis		*				*					
Scylla serrata										*	*
Gonodactylus sp.				*		*					
Panulirus penicillatus					*	*					
Annelida (Worms)											
Loimia medusa	*					*					
Spirobranchus sp.		*				*					
FLORAL											
Algae											
Acanthophora spicifera					1	1					
Amphiroa fragilissima				1	4	4			1	1	*
Asparagopsis taxiformis	*		*	1	1	1					
Codium arabicum			1			*					
C. edule	1		1	2	6	9		1	2	3	6
Corallina sp.				1	3	3			3	1	4
Dictyota sandvicensis					1	1			*		*
Halimeda discoidea			1			*			1	1	1
Hypnea cervicornis					*	*			*		*
H. multiformis					*	*					
Jania sp.	*			1	*	*					
Laurencia nidifica					1	*					
Padina japonica									*		*
Porolithon gardineri								*			*
Sargassum obtusifolium					*	*					

number = % substrate cover (number) = individuals counted * = present vari = variable
sp = sponges an = anemones al = algae urc = urchins

A. Featurless limestone plain with discontinous veneer of sand and rubble and scattered depressions 1.5-10 ft. wide and 4-28 ft. deep.
B. Relatively flat limestone crossed by low ridges seperated by sandy patches.
C. Irregular limestone surface with meandering grooves and small channels, 3-10 ft. wide, containing sand and rubble. Worn and rounded boulders occure throughout the area.
D. Scoured limestone with scattered depressions that are from 1-4 ft. in diameter and up to 18" deep. Area is covered by thin layer of silty-sand.
E. Sand covered limestone bisected by series of small spurs, groves and depressions generally oriented perpinducular to shore. Depressions range from 3-12 ft. in width, 3-16 ft. in length and attain maximum depth of 30 in..
F. Silt-sand vaneered, slightly undulating limestone surface pocked by scattered depressions. Superimposed on this topography are large (12-15 ft.) circular depressions (3 ft. deep) that suggest an impact zone of a target range.
G. Limestone and sand strewn with rubble and scattered boulders. Sand covers 65-70 % of area.
H. The seaward edge of a submerged limestone block (ancient beachrock formation) slopes sharply towards a limestone substrate that is fractured and undercut.

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TABLE 7

SUMMARY OF THE BIOTA OF THE EAST AND WEST ENTRANCE CHANNELS

	EAST ENTRANCE CHANNEL			WEST ENTRANCE CHANNEL		
Biota	Count	Coverage	Number of Species	Count	Coverage	Number of Species
algae		16%	13			8
sponge		4%	1		2%	3
anemone			2			1
coral		3.7%	6		4.1%	7
sea cucumber	35		2	5		2
urchin	191		4	182		4
cone shell	5		3	4		2
mussels		200/100 cm^2	1		70/100 cm^2	1
octopus	1		1	3		1
annelids			2			0

* Represents average of all stations in alignment.

The shoreline in the vicinity of the project is typically an eroded limestone bench; however, sand does occur along some sections. Immediately offshore and across much of the reef flat, a hard bottom predominates. The hard bottom may be covered by a thin layer of sand or may be a mixture of veneered limestone, outcrops, and sediment over limestone. Essentially all sand bottom areas present are sand-filled depressions. Figure 18 shows a map of the bottom type.

The massive beachrock "block" found about 120 feet off shore at the West Channel location (Station 9) is a geologically interesting feature providing somewhat unique habitat for a variety of organisms. This area would appear to be a popular destination for skin-divers, although at the present time this section of the coastline is not heavily used by divers, possibly beacuse of generally poor water clarity.

Approximately 129,000 square yards of reef flat would be dredged to create the entrance channel for the Ewa Marina. The dredging of this channel will result in a swath of deeper bottom across the reef flat, creating a mostly sand-bottom feature with relatively steep, high relief margins.

The channel margins will probably be of the nature of a sloping limestone face varying between 3 to 10 feet high. Breakwaters proposed for both sides of the East Entrance Channel would further alter the existing nearshore limestone bottom and create additional high relief submerged bottom and complex intertidal surfaces. The creation of relatively high relief, limestone bottom can be expected to enhance certain fish and invertebrate populations by providing localized cover. This effect could more than offset the anticipated loss of available cover (which is presently low in most areas) resulting from dredging of certain limestone bottom areas.

Impacts on the physical environment from channel construction would include increases in water turbidity, redistribution of fine sedimentary materials disturbed by dredging, and perhaps blast effects (from the use of high explosives to remove hard bottom).

Blast impacts are difficult to predict because of the complex relationships between size of charge, water depth, depth of charge (in substratum), and distance from blast. Localized damage to fishes and invertebrates will occur from the shock wave generated in the water column by the blast, although proper precautions (i.e., limitations on the size of the charge, separation by milliseconds of multiple blasts, etc.) can substantially reduce the area of potentially significant damage to the biota. Considerable attention has been given very recently in Hawaii to the potential impacts of blasting on the marine environment relative to other projects, specifically the West Beach Project on Oahu and the Waikoloa project on Hawaii.

Impact on Flora. Previous surveys (AECOS, 1980; Dames & Moore, 1985) have generated fairly extensive lists of the algae to be found in this reef environment. It is not unusual for the structure and diversity of algal assemblages in a given area to change in response to seasonal changes in water temperature, wave and swell, and grazing pressure by mobile herbivores. Thus, while differences in species dominance and overall algal abundance were noted between the present survey and earlier studies, these differences are to be expected. In the present survey, overall algal abundance was noted to be

greatest near shore (Stations 5 and 9). Algal diversity was also highest in this area. Algal cover was generally sparse at most offshore stations, and usually dominated by Codium edule, Asparagopsis taxiformis, and Jania sp. Midreef areas harbored Hypnea cervicornis, Halimeda opuntia, and Padina japonica in addition to the dominant species found off the reef margin. Nearshore areas harbored turf-forming species and fine-branching, calcareous red algae (e.g., Jania, Corallina, and Ceramium) which tend to trap sediment on the limestone substrata. Large masses of Hypnea cervicornis, unattached to the bottom but composed of many intertwined thalli, were seen in inshore areas. Additional species observed between the midreef and inshore stations include Hypnea multiformis, Laurencia nidifica, Sargassum obtusifolum, and Wrangelia penicillata.

A number of the species of algae (limu) observed are edible forms (e.g., Codium edule, Asparagopsis taxiformis, Laurencia nidifica; see Abbott and Williamson, 1974). Although limu gathering is popular off the Ewa coastline, this activity is concentratd east of Oneula Beach Park. The relatively rapid increase in depth from the shore and the generally turbid water off the project site make conditions poorly suited to limu collecting.

Impact on Corals. Although scattered coral heads occur off shore of the project site, coral cover and diversity are very low. The considerable amount of fine sediment moving across the bottom would render much of the hard substrata nearshore unsuitable for hermatypic corals. Coral cover is highest behind the reef margin (Stations 3 and 7) and in localized areas off the reef front (as typified by Station 2). Although in the area of the reef margin the rose coral, Pocillopora meandrina, is a significant component in the assemblage, species diversity is low everywhere: the assemblages surveyed are singularly dominated by encrusting heads of Porites lobata.

The effects of wave generated water motion on benthic communities will decrease with increasing depth. The frequency of prostrate growth forms in the corals surveyed in this study decreased at deeper, more offshore stations (Stations 1, 2, and 6). Prostrate growth in corals is usually associated with high energy conditions. Similarly, coral coverage appears to increase with depth and their importance is probably greater seaward of the proposed channel termini.

Of all the "major" components of reef communities, hermatypic corals are usually considered more sensitive to sediment impacts from channel dredging. However, a prominant characteristic of the existing reef environment off of the Ewa Marina Community site is an abundance of very fine, easily suspended material. Thus, the reef biota in this area is presently experiencing significant impacts from turbid water and the movement from place to place of fine sedimentary material. During channel construction turbidity and sediment deposition may be enhanced in local areas. However, the long-term impacts attributable to construction become difficult to assess, because stresses associated with fine sediments have been (and presently are) a part of this environment. Further, measuring construction impacts against this historical background is likely to be difficult because biological elements sensitive to sediment impacts are not present.

The assessment of the long-term impacts from the dredging project will benefit only a little from comparison with similar or related activities in

the marine environment. For example, at the Barbers Point Deep-Draft Harbor project significant impacts were limited to a relatively small area surrounding the dredged entrance channel (AECOS, 1985). The impact on reef corals off Ewa Marina would seem to be potentially less than that observed off the Deep-Draft Harbor, if only because the coral assemblages are less developed and already stressed by sedimentary impacts off Ewa. Dollar and Grigg (1981) demonstrated, in their investigation of a spill of nearly 5 million pounds of kaolin clay on a reef community at French Frigate Shoals, that sedimentary impacts do not always produce significant damage. These authors concluded that the actual environmental impact of the event was minor and highly localized. In this case, wave action and currents removed most of the clay from the reef in a relatively short time. Also, the morphology of the corals at this site reflect the normal physical stresses impinging on the reef environment.

Branching corals (such as Pocillopora meandrina) may be broken or separated from the bottom by the forces generated by an explosive charge set-off in the reef limestone. In general, prostrate and massive forms (such as Porites lobata) are more immune to blast damage outside of the immediate area of substratum destruction.

Impact on Other Invertebrates. Aside from corals, attached invertebrates which occur mostly throughout the survey area include sponges (most common is Iotrochota protea) and small anemones (Aiptasia pulchella). The small mussel, Brachidontes crebritriatus is exceptionally abundant in inner reef areas. A number of echinoderms occur in moderately high densities in different areas. Concentrations of Tripneustes gratilla are particularly noteworthy. Near the reef margin, Echinometra mathaei is abundant. In predominantly sand bottom areas, the holothurian, Holothura atra, is common.

Long-term adverse impacts on these species would not be anticipated. Shifts in the nature of the substratum (hard bottom changing to soft bottom of the entrance channel) would preclude repopulation by some species in specific areas, but these changes cannot be regarded as major nor significant. Depending upon the depth of sediment accumulation in the channel bottom, the "new" environment created may not differ appreciably from the present reef flat environment with respect to its suitability as habitat for the majority of the invertebrate species presently residing on this reef.

Impact on Fishes. The fish species encountered throughout the entire area are tabulated in Appendix 5. Other than Station 9, the fish communities at all stations display a low diversity and abundance. Coral reef fish abundance and diversity correlate with the degree of topographical relief. Topographical relief provides shelter and feeding sites for resident fish; this substratum complexity is frequently created by coral growth and development. The environment throughout the study area hampers the develoment of corals and, hence, the fish communities. Considerable cover is available at Station 9. This shelter derives from an old, submerged beachrock formation and extensive fractures in the formation. Fishes have taken advantage of this habitat and a number of commercially important species occur in the area. Approximately 300 feet seaward of Station 9, low relief limestone bottom was also observed to harbor a variety of reef fishes (although fish abundance is low). In this area, the limestone is produced into thin, undercut plates, the overhangs providing shelter for the fish fauna.

In general, long-term impacts on the fish fauna will depend upon the destruction and/or creation of hard bottom and topographical relief. Changes in fish diversity and abundance are very likely to reflect the overall net change from dredging in the extent of substrata of low relief (e.g., the sandy channel bottom) and high relief (e.g., the channel edges).

Fishes, particularly those with swim bladders, are among the more sensitive of marine organisms to damage from underwater blasts. Because fish populations are generally sparse on this reef, blast damage would not be great. Limitations on the size and placement of charges can be used to substantially reduce the damage zone, and ensure that marine reptiles (turtle) and mammals (porpoise and whale) are not endangered by blasting.

Appendix 5 presents a more detailed discussion of the benthic habitat at each station.

D.7 ECONOMIC ANALYSIS

The following economic analysis for the two entrance channel alignments compares marina construction costs and marina operation revenue. Marina construction costs can be divided into three major areas: onshore, offshore, and jetty/groin construction costs.

Onshore construction involves both wet and dry excavation in dredging the inland channels. Onshore construction for the West Entrance configuration is estimated to cost $1,290,000 more than for the East Entrance, due to 1,363,428 more cubic yards of material to dredge.

Offshore construction involves dredging of the entrance channel. The West Entrance has 4,000 more cubic yards of material to dredge than the East Entrance which would cost approximately $80,000 more.

Jetties/groins are needed for the East Entrance but are not needed for the West Entrance. However, a small groin is optional for the West Entrance. With construction of the small groin, the West Entrance would cost about $898,000 less than the East Entrance in terms of jetty/groin construction. Without the small groin, the West Entrance would cost $1,353,600 less than the East Entrance.

In terms of total construction, the West Entrance would cost $472,000 more to construct than the East Entrance if the optional groin is built, and $17,000 more if the optional groin is not built.

Marina operation revenue is generated from boat slip fees. Since the West Entrance configuration has 90 less boat slips than the East Entrance, the West Entrance would generate less revenue.

E. GROUNDWATER HYDROLOGY

E.1 INTRODUCTION

Two sections of the Final EIS discuss groundwater hydrology. Section 5.6.1 discusses the existing groundwater hydrology at the site, and Section 6.1.2 discusses hydrological impacts of the proposed project. The Army Corps of Engineers, in preparation of their EIS for the marina permit, requested that the applicant investigate the groundwater hydrology in more detail. The investigation was underway but had not been completed when the Chapter 343 Final EIS was published.

DLU, in their non-acceptance letter, found the EIS lacked information on the existing caprock aquifer and the potential effect of groundwater loss and salt water contamination due to marina construction. They therefore stated that the EIS should include the results of the groundwater investigation.

The Groundwater Study for the proposed Ewa Marina Community (Dames and Moore) has since been completed and is presented in Appendix 6. This chapter of the Addendum summarizes the Groundwater Study and supplements Sections 5.6.1 and 6.1.2 of the Final EIS.

E.2 EXISTING GROUNDWATER CONDITIONS

E.2.1 Existing Aquifers

Figure 19 shows a schematic representation of the aquifers of the Ewa Plain. Two aquifers are present: the deeper highly permeable volcanic aquifer which is more or less insulated from direct flushing by seawater, and the shallower less permeable interlayered coralline aquifers which are hydraulically connected to the ocean and are subject to tidal motion and mixing with seawater, particularly near the shoreline.

Volcanic Aquifer - A relatively thick lens of fresh water exists within the volcanic rock. The fresh water floats on salt water because the density of fresh water is less than that of salt water. A transition zone, consisting of increasingly brackish water separates the fresh and salt water. Infiltration of rain water in mountainous areas recharges the volcanic aquifer. Fresh water leakage from the volcanics is limited by the large thickness of confining sedimentary materials in this area, resulting in a buildup of the fresh-water lens thickness within the volcanic aquifer. This confinement results in artesian conditions within the fresh-water lens of the volcanic aquifer. In the general vicinity of the proposed Ewa Marina, the volcanics underlying the site are those of the Koolau volcano.

Based on deep borings, the Hawaii Institute of Geophysics estimates that the volcanics directly under the site are at a depth of about 1000 feet. Despite the fresh water encountered further inland, the water within the volcanics directly under the site is probably either salt water or very brackish (see Figure 19).

Coralline Aquifers - Coralline aquifers exist within the sequence of coralline and alluvial materials which make up the "caprock". In the top 300

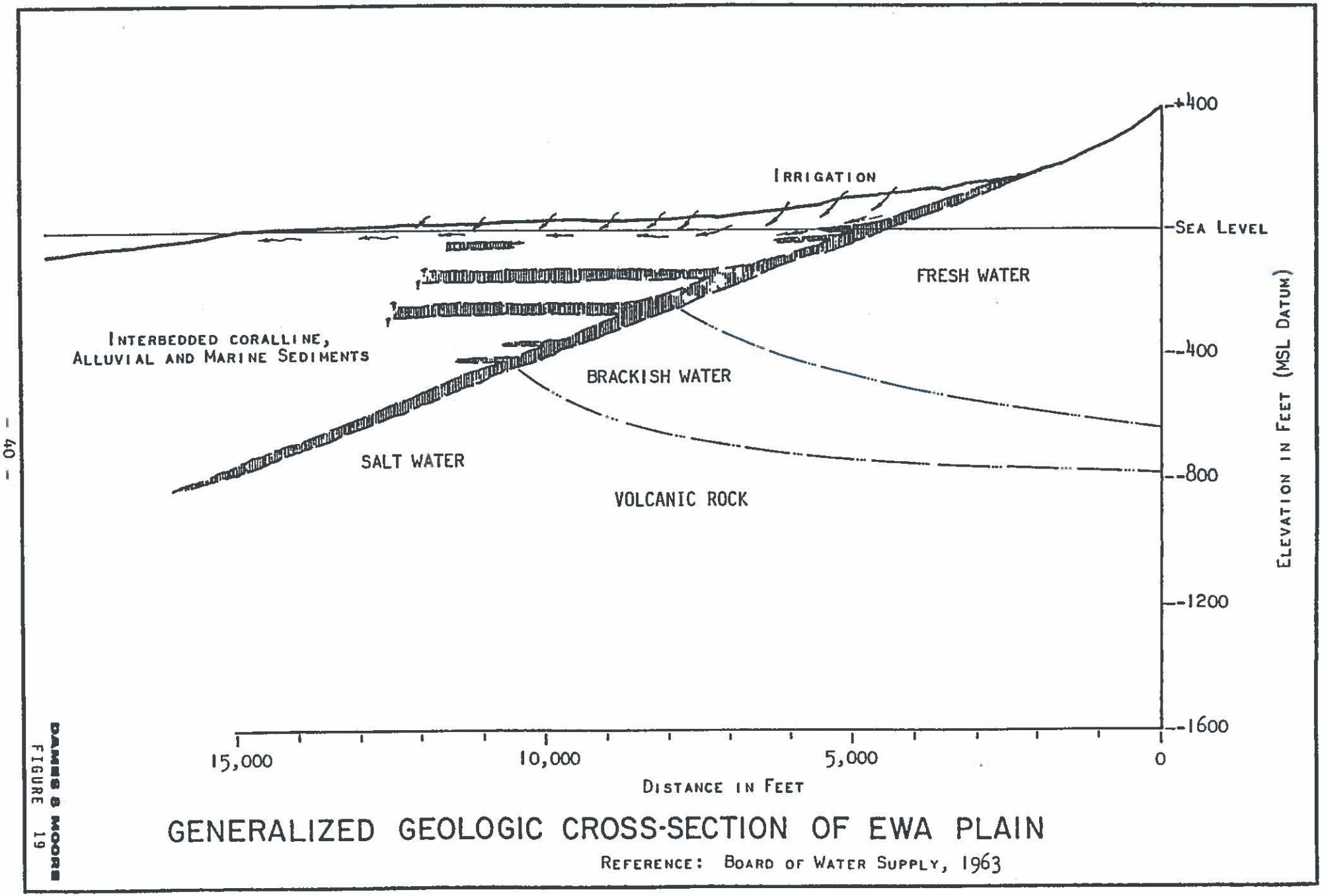


FIGURE 19

GENERALIZED GEOLOGIC CROSS-SECTION OF EWA PLAIN

REFERENCE: BOARD OF WATER SUPPLY, 1963

feet of the caprock, three limestone aquifers and at least two sedimentary aquicludes occur. The uppermost limestone, predominantly composed of a massive porites reef, has been widely tested and is known to be highly permeable. It is unlikely that the deeper limestone aquifers are as permeable as the top one.

Within the coralline aquifers, the majority of the water is salt water. Relatively fresh and brackish waters exist at shallow depths within the uppermost coralline aquifer, as a thin lens floating on the salt water. Near the shoreline the relatively fresh ground water becomes increasingly brackish due to the mixing action induced by tides and direct hydraulic connection with the ocean.

Excess irrigation water is the most important source of the relatively fresh ground water within the uppermost coralline aquifer. In fact, irrigation accounts for most of the water flowing within the thin fresh ground-water lens.

Rainfall infiltration to the uppermost coralline aquifer is limited, due to the low rainfall and the high evaporation potential within the Ewa Plain. Fresh water leakage from the volcanics at the boundary of the Ewa Plain comprises the remainder of ground-water flow into the coralline aquifer; however, this leakage does not affect the upper thin lens of relatively fresh and brackish water.

E.2.2 Existing Groundwater Use

Wells have been developed by Oahu Sugar for agricultural purposes in the eastern Ewa Plain. The existing wells closest to Ewa Marina are depicted on Figure 20, and available data on the wells is tabulated on Table 8. The total draft of these wells for 1984 was 19.2 million gallons per day (MGD).

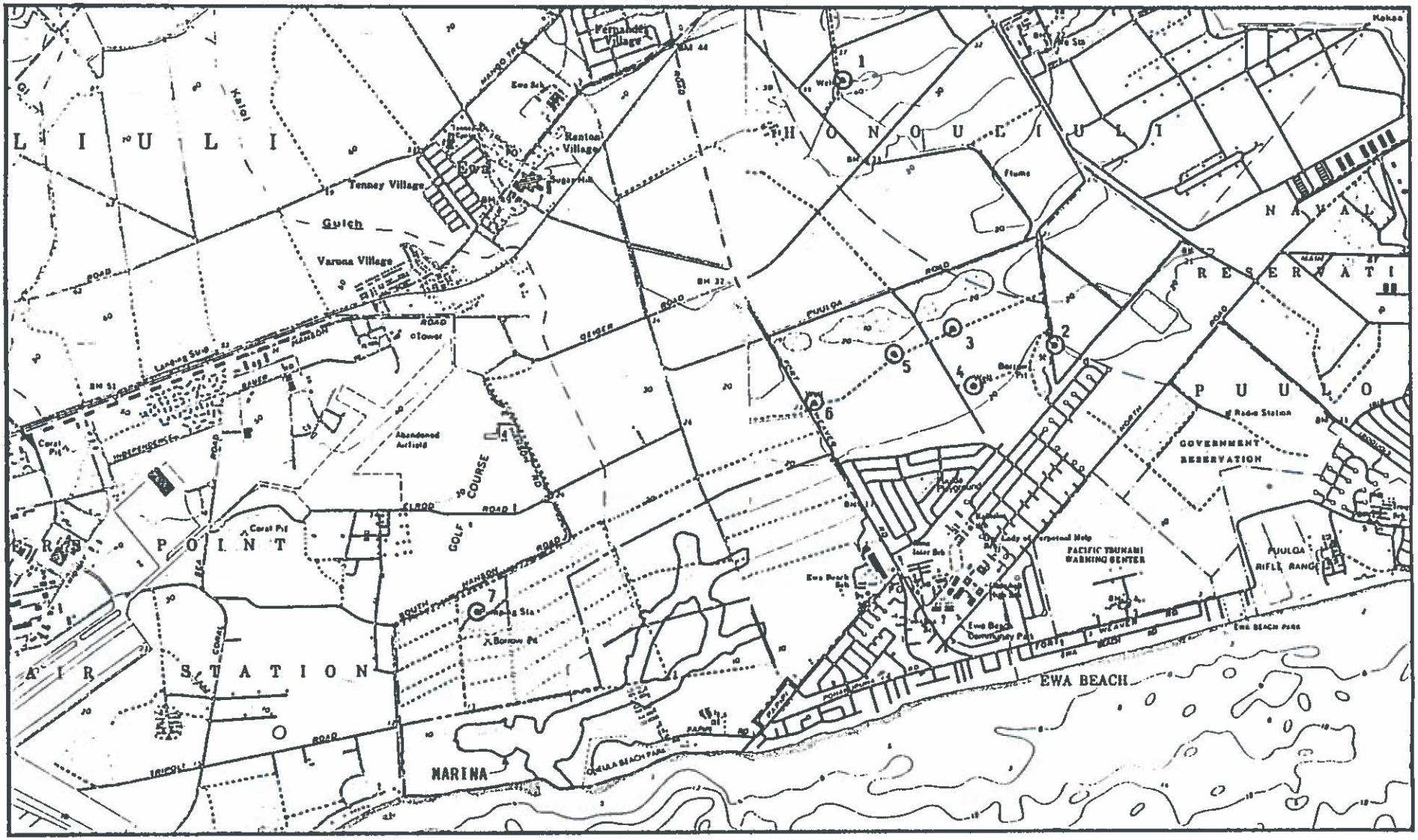
E.2.3 Existing Groundwater Flow

Flow direction of the lens of fresh to brackish water within the uppermost coralline aquifer is generally toward the coastlines. In the vicinity of the site, ground-water flow would normally be influenced by the presence of the southern coastline. Flow at the site, however, is also influenced by the existing irrigation water supply wells.

Only the lens of fresh to brackish ground water is flowing. The salt water below the fresh ground water is essentially static, although there is a very slow circulation of the salt water induced by the movement within the fresh-water lens.

Water level (static head) measurements of the shallow ground waters are erratic and individual measurements are often unreliable due to the large influence exerted by the tides. Static water levels in the vicinity of the site are on the order of less than a foot to two feet, generally of the same magnitude as the tidal fluctuations. Water levels measured at various borings for the proposed development are presented on Figure 21.

Fresh to brackish ground-water flow is normally discharged at or near the shoreline. Based on hydraulic gradient data and on an estimated hydraulic



EXISTING WELL LOCATIONS

3000 0 1000 2000

FEET

LEGEND:

⊙ Well Sites

REFERENCE:

Department of Land & Natural Resources, Div. Water & Land Dev.
State of Hawaii, 1972

DAMES & MOORE

FIGURE 20

TABLE 8

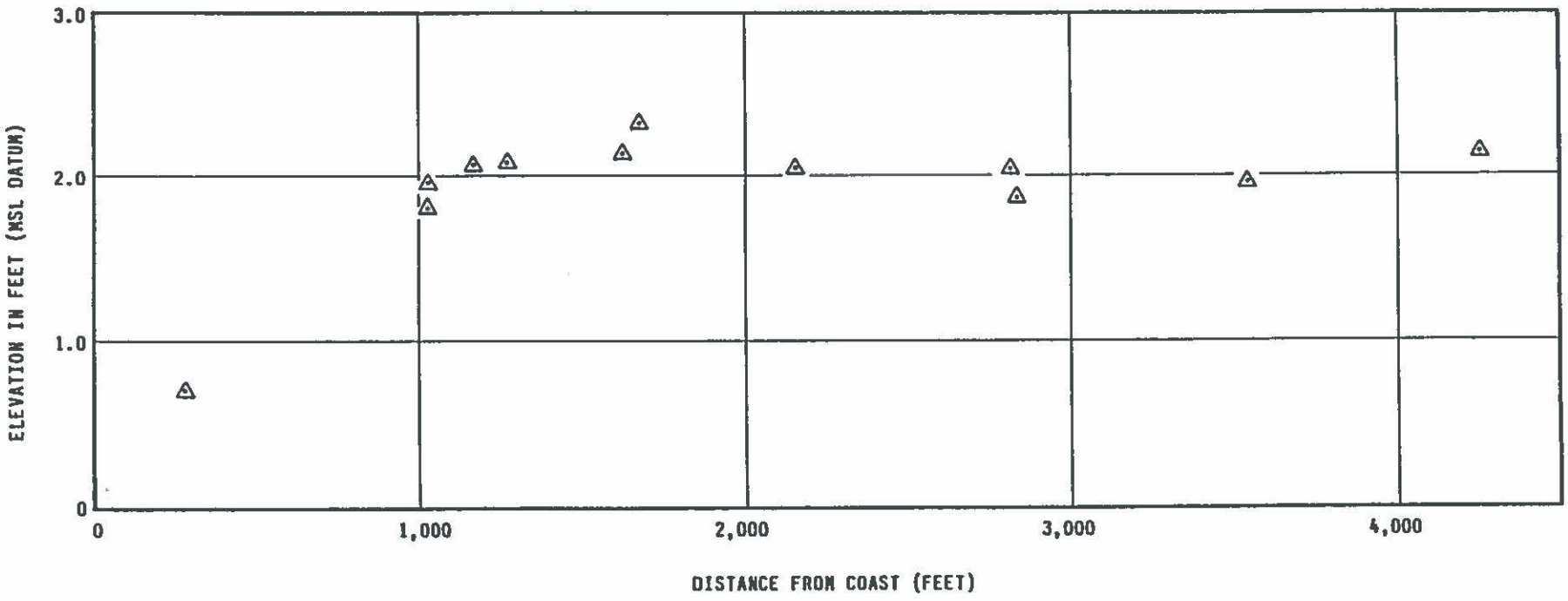
WELL DATA

Dames & Moore Well No. Oahu Sugar Well No.	1 EP 23	2 EP 30	3 EP 21	4 EP 22	5 EP 20	6 EP 24	7 EP 27A,B 28 & 29
Year Drilled	1931	1965	1930	1930	1930	1932	1964
Casing Diameter (in)	12		12	12	12	12	
Ground Elevation (ft)	43	5	25	23	25	24	5
Total Depth (ft)	47	8	30	29	30	29	8
Bottom of Hole Elev. (ft)	-4	-3	-5	-6	-5	-5	-3
Pump Capacity (mgd)					2.9		
Draft (mgd)	4.8	0.5	0.7	1.8		0.1	5.1
Static Head (ft)		1.4		2.1	0.7	1.8	
Maximum Chloride (mg/l)	898	1300	937	660	600	625	760
Minimum Chloride (mg/l)	505	639	470	520	480	472	620

Reference: State of Hawaii
Dept. of Land & Natural Resources
Division of Water & Land Development
August 31, 1984

BY _____ DATE _____
CHECKED BY _____ FILE _____

REVISIONS
BY _____ DATE _____



AVERAGE GROUNDWATER LEVELS AT BORINGS

PROPOSED EWA MARINA

FIGURE 21
DAMES & MOORE

conductivity of 5,000 feet/day, Dames and Moore estimated the flow rate to the ocean to be about 230 gallons per day per foot of shoreline (GPD/ft).

Based on estimated evapotranspiration rates and irrigation water application rates for sugar-cane fields located within the Ewa plain, Dames and Moore made a second estimate of the ground water flow rate. An irrigation water recharge rate of approximately 420 gallons per day per foot of shoreline (GPD/ft) was calculated using this approach.

E.2.4 Existing Ground Water Quality

The ground water within the upper coralline aquifer consists of a thin lens of relatively fresh water flowing over relatively static salt water. The thickness of the fresh-water lens varies with the hydraulic head. As the shoreline is approached, the hydraulic head and lens thickness decrease.

Rather than a sharp interface between the fresh and salt waters, there is normally a transition zone where the water becomes increasingly brackish with depth. The transition zone can be very narrow in undisturbed and inland portions of the aquifer. The transition zone becomes larger where the aquifer has been disturbed by pumping or as a result of mixing induced by tidal action as the shoreline is approached. Adjacent to the shoreline, the high hydraulic conductivity and direct hydraulic connection to the ocean result in sufficient tidal-induced mixing that the entire lens becomes a transition zone with water normally considered brackish.

For this study, chloride levels were measured at operating Oahu Sugar wells. This data is compared on Table 9 with some data presented by Swain (1973) for the period 1958-1970 and by the Board of Water Supply (1983) for the period 1976-1980. The wells on Table 9 are the same wells presented on Table 2 (page 15).

The data show generally increased chlorides, indicating that the effects of conversion to drip irrigation are being felt. When Oahu Sugar converted to drip irrigation, they reduced the total volume of irrigation water applied. Also, instead of proportionately reducing the quantities of volcanic and caprock source irrigation water, only the volcanic source water was reduced. This had the effect of exacerbating the chloride problem as the water then is being recyled in an almost closed loop, resulting in an accelerated increase in chlorides. Conversion to drip irrigation was initiated in 1973 and substantially completed by 1978.

We understand that Oahu Sugar now plans to return to use of volcanic source water for drip irrigation. This will temporarily help the chloride problem, but the long term effects of the reduction in irrigation water applied will eventually be felt.

According to Dames and Moore, percolating irrigation water has a marked effect on the water quality of the Ewa Plain. Large quantities of soluble nitrates from fertilizers and silicates leached from the soil are picked up by the percolating irrigation water. Some sulfate originating from fertilizers can also be picked up by the percolating waters. In addition, large quantities of orthophosphate enter the percolating irrigation water, but most of the phosphate is rapidly fixed by lateritic soil (Swain, 1973).

TABLE 9

CHLORIDE DATA

Oahu Sugar Wells

Dames & Moore Well No.	Oahu Sugar Well No.	DLNR/USGS Well No.	1958-1970[1] (mg/l)	1976-1980[2] (mg/l)	1986[3] (mg/l)
1	23				1100
2	30	1900-13	640-1300		1020
3	21	2000-01	480- 610		930
4	22	1900-02	590- 670		830
5	20	1900-01	470- 590		920
6	24	1901-01	440- 590		940
7	27A&B, 28, 29	1902-01	620- 840	585-800	870

[1] Reference: Swain (1973)

[2] Reference: Board of Water Supply (1983)

[3] Dames & Moore Test Data (1986)

As quantities of fertilizers and other nutrients are probably applied at the same rate, the conversion to drip irrigation would also tend to increase the concentrations of nitrates and phosphates in the ground water.

E.3 IMPACTS ON GROUNDWATER DUE TO MARINA CONSTRUCTION

E.3.1 Groundwater Flow Effects on Marina

Excavation of the marina will be identical to shifting the sea coast inland, as if a new embayment were created by natural processes. Excavation will not affect the basic structure of the aquifer. The relatively shallow excavation, also, will not affect the ability of the approximately 1,000-foot thick sedimentary/alluvial deposits to act as an effective caprock over the volcanic aquifer.

Ground-water flow into the marina, in the long term, will be determined by the inputs to the ground-water system, specifically by irrigation inputs. Dames and Moore estimated existing flow rates at approximately 230 to 420 gallons per day per foot of existing shoreline. Inflow into the marina would approximate this in the long term given constant conditions, however, ground-water flow rates are in a state of transition due to the effects of conversion to drip irrigation. It is anticipated that the rate of ground-water flow into the marina will decrease.

Initial ground-water flow into the marina would be greater than the long term flow, as there will be a transition period while ground water in storage in the near vicinity of the marina drains. However, Dames and Moore anticipates that much of this transition would occur during the relatively extended period of marina dredging.

E.3.2 Impact on Oahu Sugar Wells

Available information on the irrigation wells are tabulated on Table 8. Significant changes in the flow, heads, and water quality are occurring within the caprock aquifer, as a result of the change to drip irrigation and the termination of the use of pipe transported volcanic source water. This is supported by recent water quality data taken during this study, which indicates that salinity and nitrates are at higher levels than previously measured.

Dames and Moore indicates that the marina construction will result in a limited amount of additional head reduction. The effects on the amount of water available and the quality of the water, resulting from the marina, will be insignificant. Dames and Moore applied a ground-water computer model to analyze the effects of marina construction and the effects of drip irrigation. The analyses indicate an absolute value of head change ranging from 0.05 to 0.17 feet due to construction of the marina, and an absolute value of head change ranging from approximately 0.19 to 0.95 feet due to the changes in irrigation practices. Percentage head changes due to marina construction range from approximately 0.2 to 7.7 percent of those due to changes in irrigation practices.

Marina construction is not expected to significantly affect the amount or quality of water available at existing irrigation wells, for the following reasons:

a. The head reductions due to marina construction are approximately an order of magnitude less than those due to conversion to drip irrigation.

b. The head reductions due to marina construction are due to a reduction in flow length (excavating the marina shifts the sea coast inland and thus shortens the flow length), while the reductions due to drip irrigation are due to a reduction in the quantity of flow. The flow quantity is the primary factor in determining the quantity of water which can be pumped from a well without increasing chlorides excessively.

c. The existing wells skim the top of the groundwater lens and the quality of ground water extracted would not be affected by small head decreases.

Water quality at the existing wells will degrade in the future, primarily due to residual effects of the change to drip irrigation.

According to Dames and Moore's groundwater study, water quality at the proposed wells at the Ewa Marina Community should be affected more by future irrigation inputs than by construction of the marina.

F. ROADS AND TRAFFIC

F.1 INTRODUCTION

Sections 4.6.4 and 6.4.1 of the Final EIS present the proposed roadways and access roads of the Ewa Marina Community and discuss the traffic impact that would result from development of the project. In commenting on the Draft EIS, the State Department of Transportation (DOT) felt that the proposed north-south road was not adequately presented and evaluated. In addition, DLU stated that the applicant's response to DOT's comments were inadequate and should be supplemented.

On February 28, and March 12, 1986 the applicant met with DOT to discuss their commments and resolve traffic issues. This chapter of the Addendum consists of two major subsections: a discussion of traffic impacts that replaces Sections 4.6.4 and 6.4.1 of the Final EIS, and a supplemented response to DOT's comments.

F.2 TRAFFIC IMPACTS

This section, F.2, of the Addendum replaces Sections 4.6.4 and 6.4.1 of the Final EIS. In depth traffic studies were previously conducted for the Programmatic EIS and the Supplemental EIS for Increment I, and a recent traffic study was completed by Kaku Associates in March 1986. Appendix 7 contains the March 1986 traffic study and recent correspondence between the developer and DOT.

F.2.1 Roadways

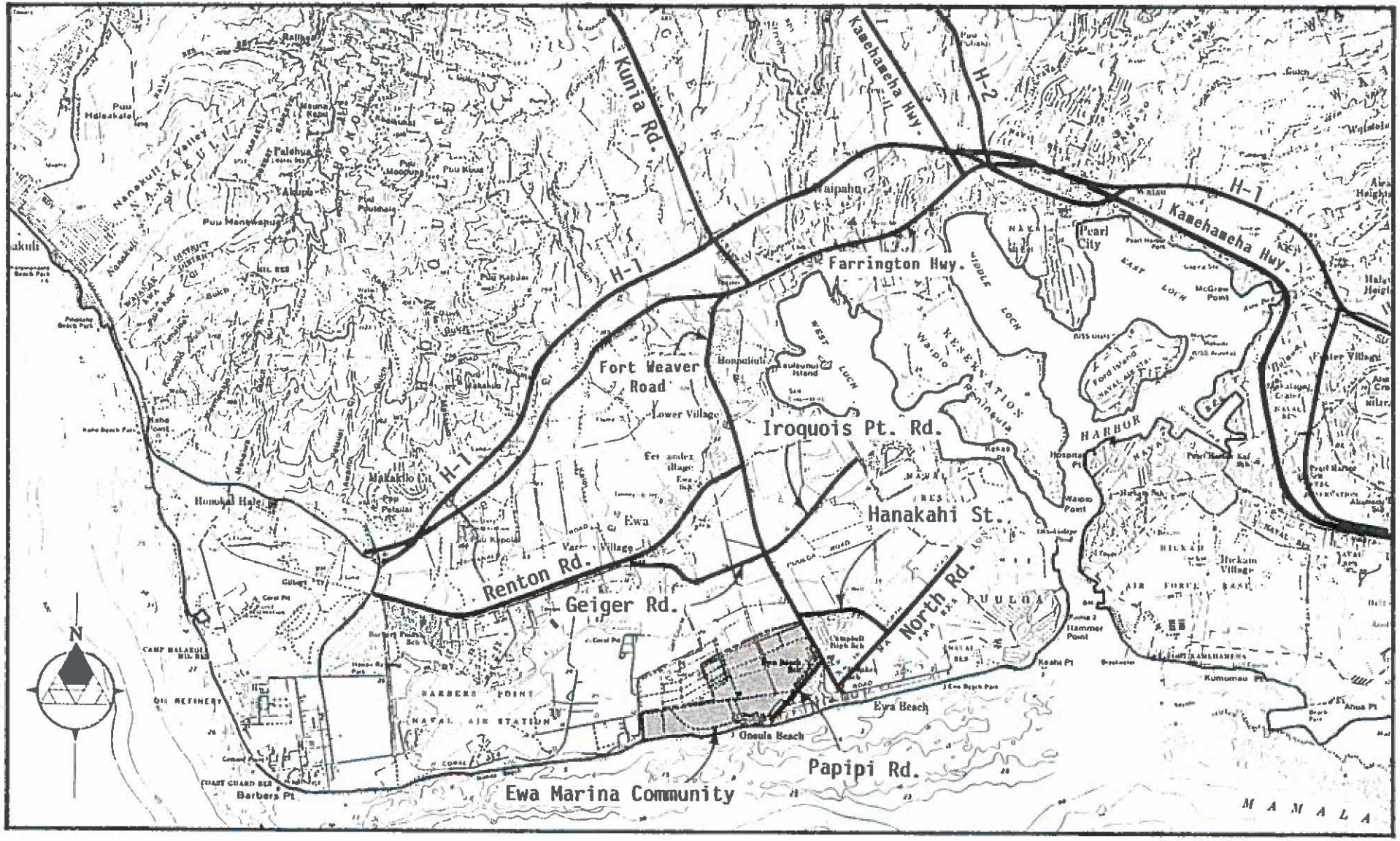
Major roadways providing access to the Ewa Marina Community are shown in Figure 22. Roadways within the community are to be designed and constructed by the developer in accordance with City and County standards, and, where applicable, with State standards, for dedication to the public system.

F.2.2 Internal Circulation

Traffic circulation within Increment II of the proposed Ewa Marina Community would be within the main roadways provided by the developers (see Figure 3). Additional circulation and access to residences would be provided within each parcel by the individual subdeveloper.

F.2.3 Traffic

Existing traffic counts taken during April and November of 1984 along various intersections on Fort Weaver Road are illustrated in Figures 23 and 24. Based upon the March 1986 traffic study for the proposed Ewa Marina Community (Kaku Associates), the following traffic generation rates were estimated for Phase 1 of the project (Phase 1 includes both Increment I and



MAJOR ACCESS ROADS
EWA MARINA COMMUNITY

5000 0 5000 10 000

FEET

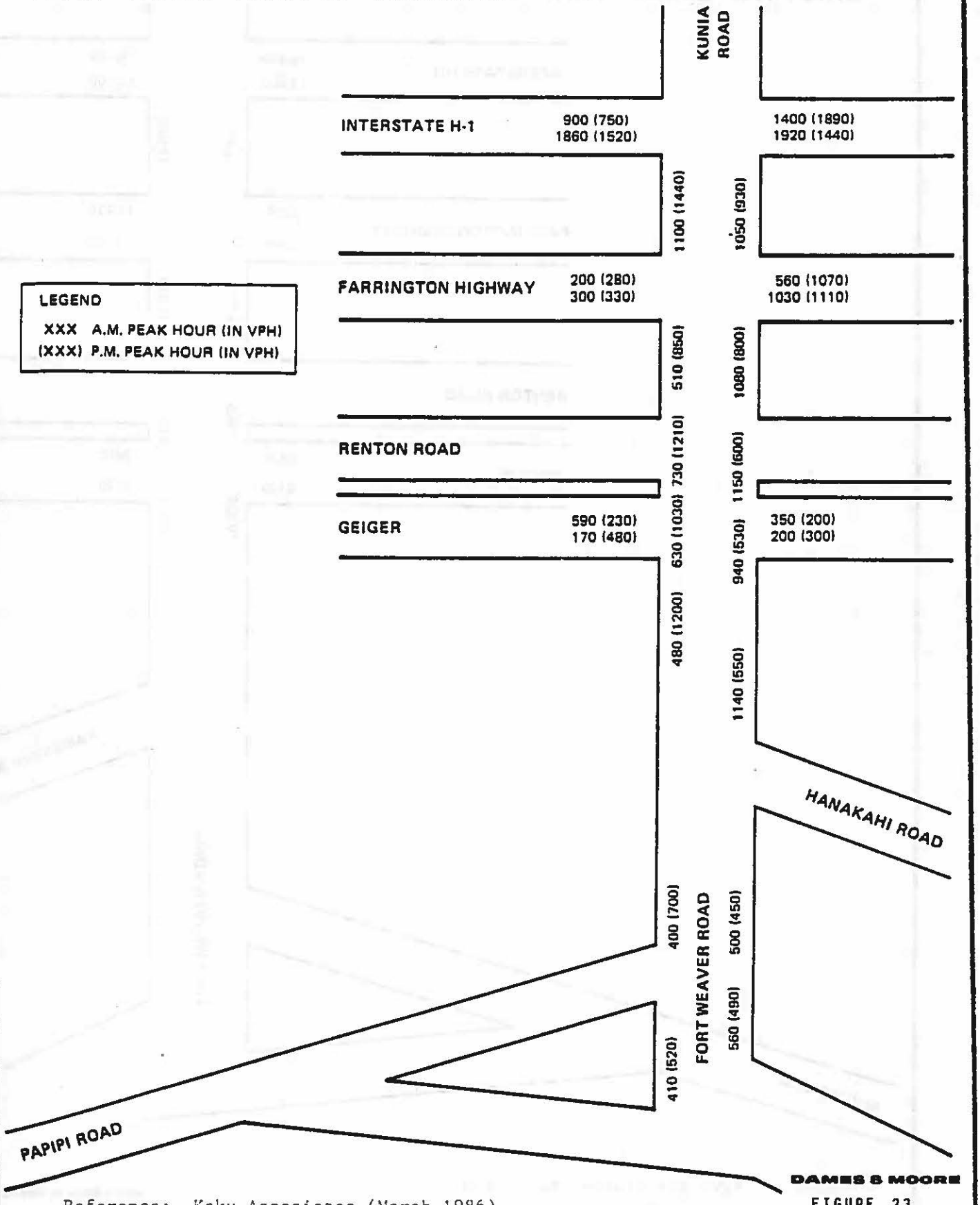
Reference:

U.S.G.S. Topographic Map, Island of Oahu
Dated 1954.
Group Architects Collabortive, Inc.
E.M.C. Generic EIS
February 1982

DAMES & MOORE

FIGURE 22

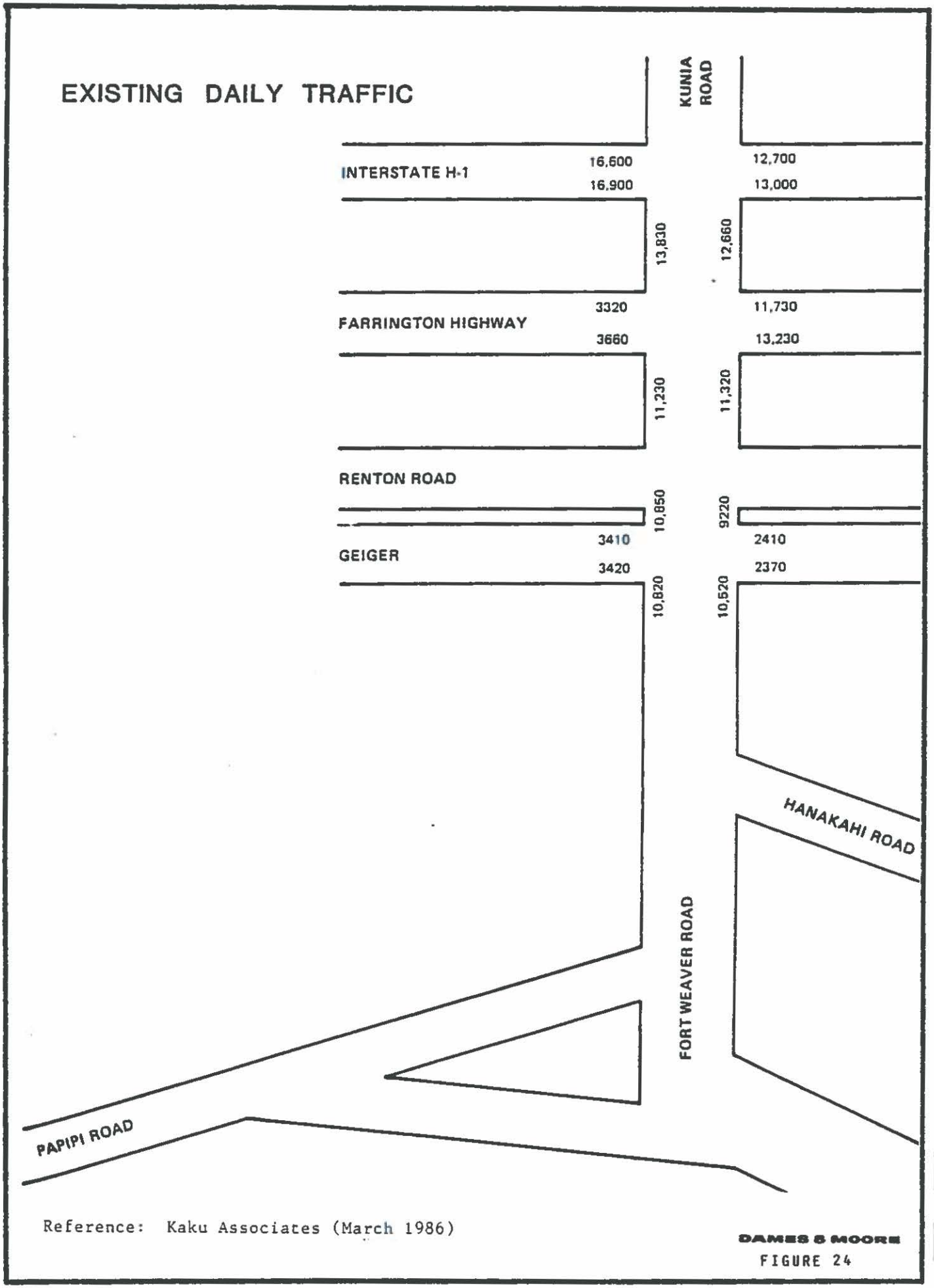
EXISTING MORNING AND EVENING PEAK HOUR TRAFFIC VOLUMES



Reference: Kaku Associates (March 1986)

DAMES & MOORE

FIGURE 23



Reference: Kaku Associates (March 1986)

DAMES & MOORE

FIGURE 24

Increment II, as shown on Figure 25):

Daily		39 790 trips/day
AM Peak	- In -	485 trips/hour
	- Out -	1,940 trips/hour
PM Peak	- In -	2,480 trips/hour
	- Out -	1,510 trips/hour

The geographic distribution of the traffic which would be attracted or produced by the development depends on factors such as places of employment, school locations, shopping and commercial areas, nearby dwelling units, and relative distances to these destinations. Based upon person-trip tables developed for Phase 1 (Increments I and II), estimates of the distribution of residential peak hour trips are as follows:

TABLE 10

ESTIMATED DISTRIBUTION PERCENTAGES FOR EWA MARINA COMMUNITY TRIPS

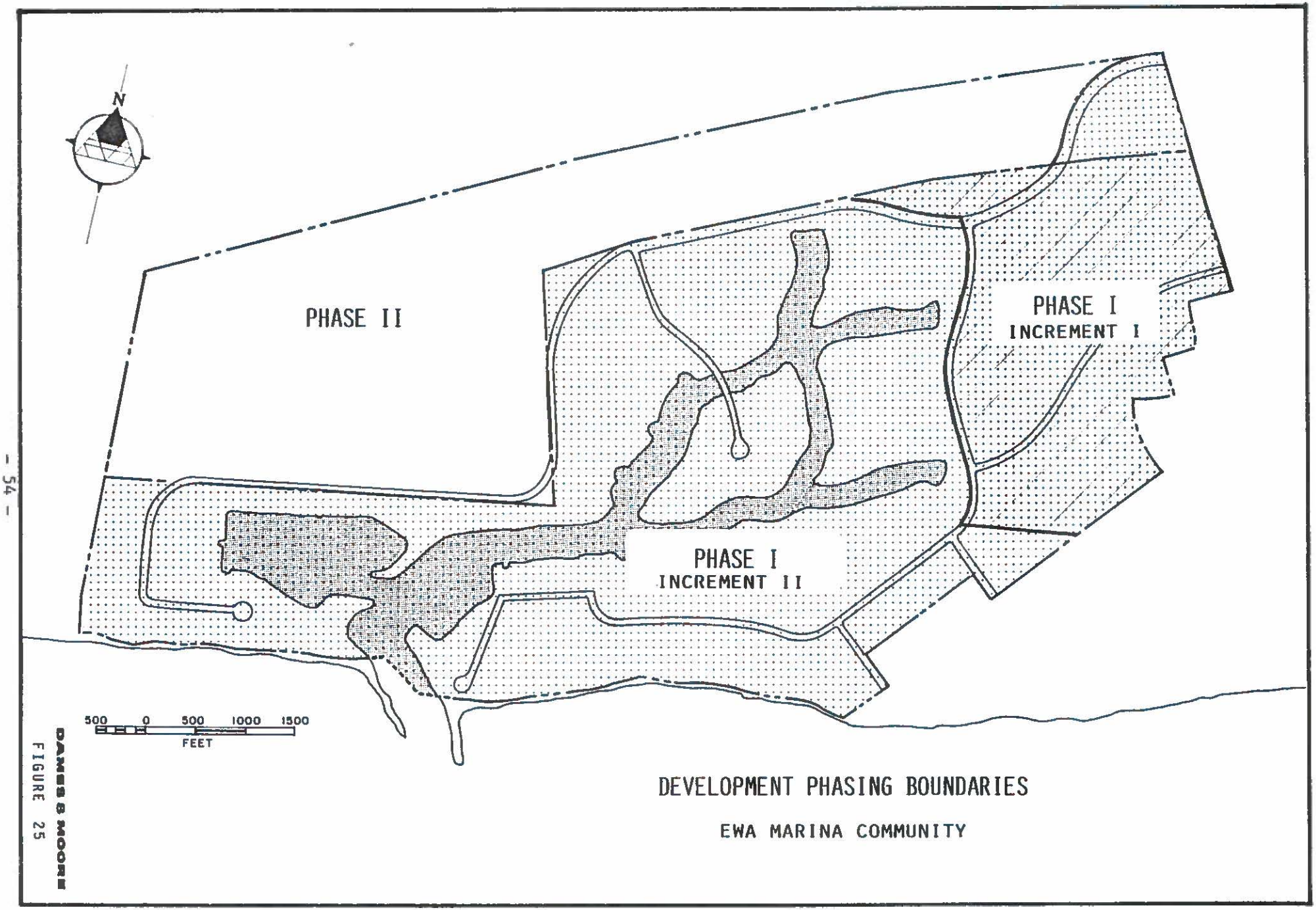
Major Area	Percentage of Total Trips
Honolulu	53
Pearl City	5
Wahiawa/Mililani	8
Waipahu	10
Makakilo	7
Waianae Coast	2
Ewa Beach	15
TOTAL	100%

These percentages represent trips to and from each area indicated. About 85 percent of trips would have destinations north of Increment II, while 15 percent would remain within Ewa Beach.

The realigned and improved Fort Weaver Road would be the only major facility which traffic would need to gain access to the project from areas north of the site. All northern traffic to and from the site would utilize Fort Weaver Road and would disperse to areas north, east or west of the project via the various ramps at the present Kunia Interchange with H-1, Renton Road, and Farrington Highway. Expansion of Papipi Road to its planned width of 70 feet is currently in the planning stage with the City & County of Honolulu.

F.2.4 Impacts on Roads and Traffic

Kaku Associates analyzed the peak hour traffic volumes forecast for Phase I of the project to assess the ability of the projected highway network to accommodate these future levels of traffic activity. Although the analysis concentrated on the intersections of key highways and streets, Kaku Associates also reviewed the capacity of the various ramps onto and off of Interstate H-1 and the Farrington Highway at Fort Weaver Road.



DEVELOPMENT PHASING BOUNDARIES

EWA MARINA COMMUNITY

FIGURE 25

DAMES & MOORE

Major highway improvements which are part of the Phase I analysis include: completion of the widening of Fort Weaver Road into Ewa Beach itself to North Road; signalized intersections along Fort Weaver Road, including intersections at Ewa Marina Community internal Roads A and B; separate left-turn storage lanes at each of the major intersections, including Renton Road, Geiger Road, Hanakahi Street, and Papipi Road; left-turn lanes and right-turn storage lanes in the southbound approaches of Fort Weaver Road at the intersection with Roads A and B; and double left-turn lanes from Roads A and B onto Fort Weaver Road.

Kaku Associates compared the projected Phase I traffic volumes to the estimated capacity at each of the facilities described above, including:

- All major intersections on Fort Weaver Road.
- Intersections of Road A and Road B of Ewa Marina Community with Fort Weaver Road.
- On and off-ramps to Interstate H-1 from Kunia Road.
- On and off-ramps at Fort Weaver Road/Farrington Highway interchange.

Several facilities would be at or near capacity as a result of the additional traffic generated by the Ewa Marina Community. The following facilities would have volumes of at least 90 percent of the estimated capacity during the morning peak hour:

- The intersection of Road A of the Ewa Marina Community with Fort Weaver Road.
- The intersection of Hanakahi Street with Fort Weaver Road.
- The intersection of Geiger Road with Fort Weaver Road.
- The intersection of Renton Road with Fort Weaver Road.
- The ramp from Kunia Road to eastbound H-1.
- The ramp from northbound Fort Weaver Road to eastbound Farrington Highway.

During the evening peak hour, the following would be operating under these conditions.

- The intersection of Hanakahi Street and Fort Weaver Road.
- The intersection of Geiger Road and Fort Weaver Road.
- The intersection of Renton Road and Fort Weaver Road.
- The ramp from eastbound H-1 to Kunia Road.

Kaku Associates indicate that although several locations are expected to operate at a poor level of service, the volumes at none of the locations is

expected to exceed the projected capacity. This is true for either peak period. The traffic from the Ewa Marina Community is expected to impact conditions at each location differently. At each of the intersections along Fort Weaver Road, the impact is relatively proportional to the volume of traffic the project is expected to generate, in comparison to the volumes which are expected to exist without the project. This occurs because of the lack of any alternate routes which are available to Ewa Marina-generated traffic.

At other locations, the impact is less because alternate routes are available. An especially significant fact is that the Ewa Marina adds only 6 percent to the total traffic on the ramp from Kunia Road onto eastbound Interstate H-1. This occurs because a significant volume of traffic is expected to be diverted onto Farrington highway away from H-1 as a result of the development. This is a manifestation of a phenomenon resulting from the "leveling off" of traffic. The traffic volumes would divert to less congested facilities as congestion levels on the preferred facility increase. The H-1 is the preferred route but Farrington Highway will be used as the logical second choice.

F.2.5 Second North-South Roadway

The results of the analysis by Kaku Associates indicate that the future traffic volumes on Fort Weaver Road projected to occur by the completion of Phase I of the Ewa Marina Community and the remainder of the other projects will not exceed the ultimate capacity of Fort Weaver Road. However, the magnitude of these volumes is sufficient to warrant serious consideration of a second north-south roadway which would mitigate the impact of the future growth. The developers of the Ewa Marina Community have agreed to a unilateral agreement with the City and County of Honolulu which addresses these issues directly. An excerpt from the agreement provides a description of the approach to be taken:

> "The above-described improvements shall be built as additional traffic loads are created by action of developer(s). The extent and timing of such improvements will be determined by traffic studies conducted by the developers in coordination with, and approved by, the City Department of Transportation Services and State Department of Transportation. Such studies shall be conducted every five (5) years from the effective date of this ordinance. The roadways will be designed and constructed in accordance with City standards for City roadways and State standard for Fort Weaver Road (including intersections).
>
> Costs for Items a through c above will be assessed to the developers involved in a manner determined by themselves and approved by the City and State."

Although a specific timetable is provided for the construction of this roadway, the timing for its completion is tied directly to a more tangible factor -- the actual traffic impact of future development on Fort Weaver Road.

The timetable planned for the proposed project envisions an absorption rate which is sufficiently slow that the incremental traffic impacts would be

less severe. The slow absorption would be accompanied by slow growth in traffic, permitting time for adjustments in travel patterns, especially for commuters, and for improvements to the street/highway network and the public transportation system.

There are several mitigating circumstances which are likely to reduce the impact of the Ewa Marina Community Project traffic on the highway system, especially prior to the completion of the second north-south roadway.

With the completion of the Barbers Point deep draft harbor, there will be an increase in the commercial and industrial activity in West Oahu, especially at the Campbell Industrial Park. Because the analysis assumed minimum levels of employment at the industrial park, these changes would reduce the volume of traffic which would travel on Fort Weaver Road to Farrington Highway and H-1, thereby relieving the congestion levels at these two interchanges.

In their analysis, Kaku Associates used the current bus patronage. As residential development continues and population densities increase, bus ridership should increase. Increased transit usage is a logical expectation given future improvements to the bus system, increase costs to own and operate automobiles, increased congestion on highways, and measures to provide priority facilities for buses and car-pools.

F.3 DEPARTMENT OF TRANSPORTATION CONCERNS

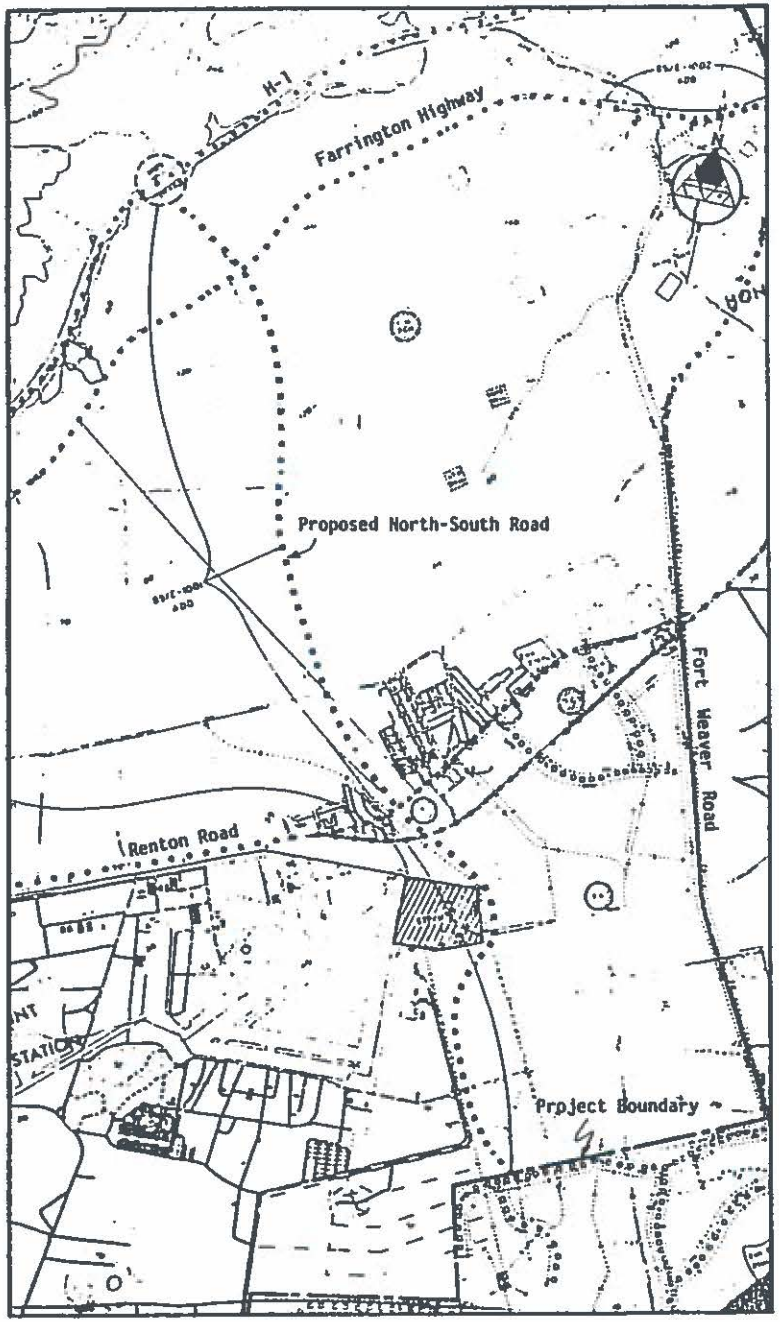
On February 28, 1986 the applicant held a meeting with DOT to discuss DOT's comments on the Draft EIS. DOT submitted their comments in a letter dated November 8, 1985 to DLU, which is presented in Chapter G of this Addendum along with the applicant's response. As mentioned above, DLU stated that the applicant's response needs to be supplemented. This section of the Addendum, F.3, provides a supplemented point-by-point response to DOT's concerns which summarize what was discussed at the meeting.

1. Maps presented in the DEIS (Figures 4-3, 5, 10, 17 to 22, 5-1 to 8, 11) should clearly indicate the limits or boundaries of the Increment II area.

Figure 25 delineates the boundaries of Phase I: Increments I & II; and Phase II of the project.

2. The developer should be informed that, based on previous trends, a large proportion of Ewa's future traffic will be headed towards Honolulu. Consequently, we agree with the developer's traffic consultant that the North-South Connector Road be aligned roughly parallel to Ft. Weaver Road and connect to a new interchange at Interstate Route H-1. The new road and interchange shall be funded by the developer and/or the landowner.

The developer is willing to participate in funding the new North-South Connector Road. Figure 26 shows the location of the new North-South Road as proposed by the City and County of Honolulu Chief Planning Officer in the proposed Development Plan Public Facility Amendment.



DGP Ref. No. 85/E-1001
Map Ref. No. B-17
NB Area 23
TMK: 9-1-16, 17, 12

EWA
DEVELOPMENT PLAN PUBLIC FACILITY AMENDMENT
BEING PROPOSED

Project Title: Ewa Marina - H-1 (North/South) Arterial Connector and Interchange

Project Description: Second arterial connector between H-1 and Ewa Beach developments with interchange on H-1 between Makakilo and Kunia Road.

Project Location: Ewa plains - somewhere between Kunia Road/Fort Weaver Road and Barbers Point/Makakilo.

Amendment Request: Add: new roadway and highway interchange

Timing: Beyond 6 years

Current DP Public Facilities Map Designation: None

Current DP Land Use Map Designation: Agriculture, Residential, Low Density Apartment

Requested by: Chief Planning Officer

Basis for Amendment: Fort Weaver Road will be inadequate to handle north-south traffic which will be generated by proposed development at Ewa Beach.

A second north/south roadway facility is needed to handle future traffic from the Ewa developments.

Although this facility will handle additional traffic generated by the Ewa developments up to the H-1 highway, it will not alleviate any "down stream" problems on the major corridors leading into Honolulu, which are already heavily congested.

PROPOSED NORTH-SOUTH ROAD

FIGURE 26

DAMES & MOORE

As jointly agreed upon by the developer's traffic consultant and by the State Department of Transportation's Highway Division, the proposed North-South Road is not required for Phase I of the project and will, therefore, be addressed in detail during Phase II. Since the EIS and this Addendum encompass only Phase I, Increment II of the Ewa Marina project, it is not necessary to evaluate the details of the proposed North-South Road at this time.

3. Based on comment #2 and the project's proposal to "terminate" the North-South Connector Road at Renton Road, we believe that the northerly section of Fort Weaver Road and its Renton Road intersection will be seriously impacted. Since we find that this impact has not been previously evaluated, we feel it should be thoroughly discussed in the EIS before acceptance of the final document is recommended.

The current plans for the North-South Connector Road project it to be extended beyond Renton Road to H-1 and would include an interchange with the freeway. Therefore, it is not necessary to evaluate the impact of not having the northerly extension of this roadway. Furthermore, the traffic generated by Increment II, as discussed above, does not warrant the construction of the North-South Road. The North-South Road will be constructed during later stages of development.

4. The project's traffic impact analysis report (TIAR) indicates that both roadway accesses to Fort Weaver Road will have double left-turn lanes on the assumption that the State Highway will be widened beyond Hanakahi Street. It is probable that the widening will not occur prior to the construction of Increment II. Therefore, the developer should be ready to implement improvements (widening from the vicinity of Road B to the vicinity of Hanakahi Street) along Fort Weaver Road to accommodate the anticipated traffic increases. We note that construction funds to widen this highway section have not been appropriated to date and without the improvements, the TIAR predicts that the facility will operate at a poor level of service. Furthermore, the TIAR states that intersection improvements will be implemented at Roads A and B along fort Weaver Road, during the construction of Increment II. These intersection improvements include separate right-turn lanes on Fort Weaver Road for southbound traffic, separate left-turn lanes on Fort Weaver Road for northbound traffic, and signalization. All of these improvements shall be funded by the developer.

The funds for the widening of Fort Weaver Road from Renton Road to Hanakahi have been appropriated, bids have been accepted, a contractor selected and construction is expected to commence by April, 1986, with completion anticipated by early 1987. The most recent traffic study for Ewa Marina indicates that Increment I traffic, which is projected to be completed within a 1990 timeframe, can be accommodated by Fort Weaver Road with the widening completed to Hanakahi Street. Although the funds for the widening of the final segment of Fort Weaver Road from Hanakahi Street past Road B of Ewa Marina have not been appropriated, it is anticipated that this will be accomplished during the 1987 Legislative session with the further expectation that construction can start as early as the Fall of 1987. Construction for

Increment II of Ewa Marina should begin well after the completion of this roadway widening project.

5. The TIAR indicates that left-turn lanes will also be necessary at Renton Road, Geiger Road and Papipi Road. In addition, the developer should thoroughly analyze the Fort Weaver Road/Hanakahi Street intersection and implement any needed improvement there at his cost.

The analysis for the intersection of Hanakahi Street and Fort Weaver Road assumed the following configurations for the three approaches:

- The southbound approach on Fort Weaver Road would have an exclusive left-turn storage lane and one through lane.

- The Northbound approach would have one through lane.

It is projected that all of the separate turn lanes are needed to accommodate the existing and projected traffic for the area, not necessarily because of the projected traffic expected to be generated by Ewa Marina, Phase I, Increments I & II.

6. Another unresolved issue concerns the proposed park which is located alongside Fort Weaver Road. As we have previously mentioned, the park should be located away from the highway in order to accommodate the Hanakahi Street intersection improvements and/or the widening of this facility.

The location of the proposed park was determined jointly by the developer and by the City and County of Honolulu, Department of Parks and Recreation. The developer has specified that 12 feet of land abutting Fort Weaver Road be dedicated to the State Department of Transportation for future Ft. Weaver Road expansion.

7. We are currently discussing with Campbell Estate representatives the approximate timetable for the construction of the North-South Connector Road. Notwithstanding, it should be clearly established that all highway improvements required by the Ewa Marina Community development, including the North-South Connector Road and any required improvements along Fort Weaver Road, shall be funded by the developer and/or landowner.

As mutually agreed upon at the February 28 meeting, the above discussions under Items 2 through 6 adequately address Item 7.

8. The developer and landowner should be informed that we are very concerned about the effects of large developments on the downstream sections of our highway system. Consequently, we are presently considering methods to obtain developer assistance in order to fund needed improvements.

The developer is willing to assist in programs that will ease the flow of traffic in downstream sections of the highway system, such as "Park and Ride" Facilities, "commuter clubs," or other programs that would facilitate commuter traffic to and from the Ewa Marina Community.

9. It was our understanding that the developer, in consideration of the Airport Division's guideline that the 60 LDN contour should be the demarcation beyond which residential development should be discouraged, would incorporate a covenant for future homeowners and residents for properties within and in proximity to the areas impacted by aircraft noise exposures of 60 LDN or greater. In reviewing the subject documents, we find no such discussion or mention of such a covenent. We would appreciate information on the developer's intent and actions regarding this matter.

On March 12, 1986, the developer and his consultants met with DOT's Airport Division to discuss Item 9. As requested by the Airport Division, the developer will provide a covenant indemnifying the State and the City and County for residential sales in areas exposed to 60 Ldn or greater. A copy of the covenant will be forwarded to DOT for their review before the document is finalized.

10. In our earlier discussion with the developer, a public boat launching ramp facility was to be included in this development. We find statements only mention the 1600 slip marina with 1000 of these berths to be available to the general public. No mention is made for a boat launching facility. Our studies indicate the demand for such a facility in that area is very high. Further, drainage into the waterway must be controlled to insure pollutants and debris are not introduced into the water.

The Final EIS contains the following statement:

> "Boat launching facilities (ramps or hoists) would also be available to residents and the general public on an equal pay-basis. Launching facilities are shown on Figure 4-7."

Figure 4-7, showing the locations of the launching facilities, is presented as Addendum Figure 7.

As stated in Dames & Moore's letter to DOT dated December 4, 1985:

> "The storm drainage system will be designed in accordance with the City & County design standards and will include impact-type energy dissipation structures where storm drains enter the marina. In addition, a marina patrol will be employed to remove debris that may collect in the marina."

G. CORRESPONDENCE

This Chapter of the Addendum contains the following letters for reference:

Letter to the State of Hawaii Office of Environmental Quality Control from Dames and Moore, dated April 16, 1986.

Letter to Dames and Moore from the State of Hawaii Office of Environmental Quality Control, dated April 25, 1986.

Letter to Dames and Moore from the University of Hawaii Environmental Center, dated February 10, 1986.

Letter to the City and County of Honolulu Department of Land Utilization from the State of Hawaii Department of Transportation, dated November 8, 1985.

Letter to the State of Hawaii Department of Transportation from Dames and Moore, dated December 4, 1985.

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-3585
Cable Address: DAMEMORE

April 16, 1986
13822-001-11

James W. Morrow, Chairman
Environmental Council
465 South King Street
Honolulu, Hawaii 96813

Dear Mr. Morrow:

Ewa Marina Community
Final Environmental Impact Statement

As you know, the Final EIS for Ewa Marina, dated December 5, 1985, was determined non-acceptable by the Department of Land Utilization (DLU). DLU determined that the EIS lacked a full evaluation of one of the alternative entrance channel alignments, in addition to three other deficiencies.

Following Declaratory Ruling #83-01, we chose to prepare an addendum to correct the EIS. In preparation of the addendum, we further evaluated the alternative channel alignment and concluded that this alignment would have less of an impact on the environment and would, thus, be more desirable than the proposed alignment.

In the addendum we would like to present this alternative as the preferred entrance channel alignment; however, we are concerned as to whether or not this is permissible under Declaratory Ruling #83-01. Can we substitute our proposed design with one of the alternatives mentioned in the Final EIS and still proceed with an addendum, or do we have to prepare an entirely new EIS?

Please provide a written response. Thank you.

Yours very truly,

DAMES & MOORE

Jennifer J. Klevens

Jennifer J. Klevens
Assistant Environmental Scientist

JJK:mjo(3024A/282A:13822-001-11)

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
ENVIRONMENTAL COUNCIL
465 South King Street, Room 115
HONOLULU, HAWAII 96813

James W. Morrow
Chairman
TELEPHONE NO.
(808) 548-6915

April 25, 1986

Ms. Jennifer J. Kleveno
Assistant Environmental Scientist
Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816

Dear Ms. Kleveno:

Subject: Environmental Impact Statement for Ewa Marina Community

This is written in response to your letter of April 16, 1986 regarding the subject environmental impact statement. According to your letter, you are presently in the process of preparing an addendum to correct deficiencies identified by the Department of Land Utilization. In your evaluation of one of the alternative entrance channel alignments, it was found that this alignment would be more desirable than the originally proposed alignment. You are therefore, asking whether you can change the preferred alignment and include discussion of that change in the addendum or if an entirely new statement must be prepared.

Our answer to this question is that it is permissible to use the addendum to disclose the new preferred alignment provided that it is clearly indicated that the preferred alternative has changed and that the new preferred alternative is described and evaluated in the same depth as the previous preferred alternative. The addendum should also include by reference the original non-accepted environmental impact statement. Since the addendum

will enter the process at the same step as a draft environmental impact statement, the public will be afforded a chance to review and comment on the change in the preferred channel alignment.

Should you have any further questions, please feel free to contact me at 537-5966 or Faith Miyamoto at 548-6915.

Sincerely yours,

James W. Morrow
Chairman

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

February 10, 1986

Jennifer J. Kleveno
Dames and Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816

Dear Ms. Kleveno:

Draft Environmental Impact Statement
Proposed Ewa Marina Community
Ewa, Oahu

Thank you for your response to our comments on the Draft EIS for the proposed Ewa Marina Community development project.

Project Description and Alternatives

We are pleased to learn of the ongoing hydrogeological study of the marina to evaluate the potential changes in the caprock aquifer due to the marina and to learn also of the consideration of the nutrient content of the groundwater entering the marina. A major issue of general concern involves the question of adequate flushing, which can only be assessed if the input parameters, particularly the high nutrient groundwater inflow and residence times, are known. The ongoing studies to which you refer should provide that information.

Proposed Marina and Waterways

You are quite correct that hydraulic model studies of marina flushing per se are of limited value due to turbulent mixing and wind-generated currents. Our intent was to emphasize the need for model studies to determine the optimum design, shape, size and orientation of the entrance facility and marina basin. Each of these parameters will, in turn, influence the water motion in the marina and affect the characteristics of its quality.

Littoral Drift

Your response to our coments regarding the possible effects of the jetty and marina development on adjacent sand deposits does not agree with the discussion of possible sand erosion provided in the Draft EIS. Certainly the deflection of long-shore currents by structures placed perpendicular to the shore such as those at harbor (marina) entrances, are well known to have the potential to create offshore currents capable of transporting sand offshore and beyond the littoral cell or to cut off the supply of sand from up current beaches. In either case a redistribution of sand from the pre-development condition is highly probable. We believe this issue should be addressed more fully.

Tsunamis

In estimating the maximum tsunami elevation in the marina, it would indeed "not be appropriate to scale up the Honolulu amplitude to match the 9-foot run-up observed at Ewa" for the 1960 tsunami, as stated in the response, if the Honolulu amplitude used in the scaling were recorded by the tide gauge in Honolulu Harbor. We suggest that the best estimate would be produced by the following equation:

$$H_{E_m} = r_1 r_2 H_{E_s}$$

where H_{E_m} = maximum elevation in marina

H_{E_s} = maximum run-up on Ewa Beach shore

r_1 = amplification factor for marina computed considering Ewa marigram similar to Honolulu marigram

$r_2 = H_{H_t}/H_{H_s}$

H_{H_t} = maximum elevation recorded in Honolulu marigram

H_{H_s} = maximum run-up on shore near Honolulu Harbor entrance.

Taking H_{E_s} = 9.0 (historic run-up record)

r_1 = 7.5/4.1 (factor used in EIS)

H_{H_t} = 4.1

H_{H_s} = 5.0 (historic run-up record)

$$H_{E_m} = (9.0)\left(\frac{7.5}{4.1}\right)\left(\frac{4.1}{5.0}\right) = 13.5$$

If a safety factor of two were applied as suggested in the EIS, the maximum tsunami elevation to be allowed for in the marina would be (2) (13.5) = 27 feet, not 15 feet. It is not clear, however, whether friction was taken into account in the EIS in estimating r_1. Although the run-up of the 1960 tsunami at the Ewa Beach shoreline would have been greater than 9.0 feet if the proposed marina channel across the reef had existed, frictional damping will probably be greater in the proposed marina than in Honolulu Harbor. Hence allowance for a 15-foot maximum tsunami elevation in the Marina may be adequate, although the safety factor 15.0/13.5 is only 1.11.

We appreciate your response to our earlier comments and hope you will find these additional comments of help in your design of the project.

Yours truly,

Jacquelin Miller
Acting Associate Director

cc: OEQC
John Whalen
Patrick Takahashi
Doak Cox
Hans J. Krock
Frans Gerritsen
Paul Ekern
Walington Yee

GEORGE R. ARIYOSHI
GOVERNOR

WAYNE J. YAMASAKI
DIRECTOR

DEPUTY DIRECTORS
JONATHAN K. SHIMADA, Ph.D.
WALTER T.M. HO
CHERYL D. SOON
ADAM D. VINCENT

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

IN REPLY REFER TO:

STP 8.10929

November 8, 1985

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Rezoning Application and Draft EIS for Increment II, Ewa Marina Community, Ewa, Oahu

We have reviewed the subject matter and offer the following comments for your consideration:

1. Maps presented in the DEIS (Figures 4-3,5,10,17 to 22, 5-1 to 8, 11) should clearly indicate the limits or boundaries of the Increment II area.

2. The developer should be informed that, based on previous trends, a large proportion of Ewa's future traffic will be headed towards Honolulu. Consequently, we agree with the developer's traffic consultant that the North-South Connector Road be aligned roughly parallel to Ft. Weaver Road and connect to a new interchange at Interstate Route H-1. The new road and interchange shall be funded by the developer and/or the landowner.

3. Based on comment #2 and the project's proposal to "terminate" the North-South Connector Road at Renton Road, we believe that the northerly section of Fort Weaver Road and its Renton Road intersection will be seriously impacted. Since we find that this impact has not been previously evaluated, we feel it should be thoroughly discussed in the EIS before acceptance of the final document is recommended.

4. The project's traffic impact analysis report (TIAR) indicates that both roadway accesses to Fort Weaver Road will have double left-turn lanes on the assumption that the State highway will be widened beyond Hanakahi Street. It is probable that the widening will not occur prior to the construction of Increment II. Therefore,

the developer should be ready to implement improvements (widening from the vicinity of Road B to the vicinity of Hanakahi Street) along Fort Weaver Road to accommodate the anticipated traffic increases. We note that construction funds to widen this highway section have not been appropriated to date and without the improvements, the TIAR predicts that the facility will operate at a poor level of service. Furthermore, the TIAR states that intersection improvements will be implemented at Roads A and B along Fort Weaver Road, during the construction of Increment II. These intersection improvements include separate right-turn lanes on Fort Weaver Road for southbound traffic, separate left-turn lanes on Fort Weaver Road for northbound traffic, and signalization. All of these improvements shall be funded by the developer.

5. The TIAR indicates that left-turn lanes will also be necessary at Renton Road, Geiger Road and Papipi Road. In addition, the developer should thoroughly analyze the Fort Weaver Road/Hanakahi Street intersection and implement any needed improvement there at his cost

6. Another unresolved issue concerns the proposed park which is located alongside Fort Weaver Road. As we have previously mentioned, the park should be located away from the highway in order to accommodate the Hanakahi Street intersection improvements and/or the widening of this facility.

7. We are currently discussing with Campbell Estate representatives the approximate timetable for the construction of the North-South Connector Road. Notwithstanding, it should be clearly established that all highway improvements required by the Ewa Marina Community development, including the North-South Connector Road and any required improvements along Ft. Weaver Road, shall be funded by the developer and/or landowner.

8. The developer and landowner should be informed that we are very concerned about the effects of large developments on the downstream sections of our highway system. Consequently, we are presently considering methods to obtain developer assistance in order to fund needed improvements.

9. It was our understanding that the developer, in consideration of the Airport Division's guideline that the 60 LDN contour should be the demarcation beyond which residential development should be discouraged, would incorporate a covenant for future homeowners and residents for properties within and in proximity to the areas impacted by aircraft noise exposures of 60 LDN or greater. In reviewing the subject documents, we find no such discussion or mention of such a covenant. We would appreciate information on the developer's intent and actions proposed regarding this matter.

10. In our earlier discussion with the developer, a public boat launching ramp facility was to be included in this development. We find statements only mention the 1600 slip marina with 1000 of these berths to be available to the general public. No mention is made for a boat launching facility. Our studies indicate the demand for such a facility in that area is very high. Further, drainage into the waterway area must be controlled to insure pollutants and debris are not introduced into the water.

Thank you for this opportunity to provide comments.

Very truly yours,

Wayne J. Yamasaki
Director of Transportation

cc: Dames & Moore
Attn: Jennifer J. Kleveno

Dames & Moore

1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-3585
Cable address: DAMEMORE

December 4, 1985

State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

D29

Response to Comments
Draft Environmental Impact Statement
Proposed Ewa Marina Community
Ewa, Oahu, Hawaii

Attention: Mr. Wayne J. Yamasaki
Director

Dear Mr. Yamasaki:

Thank you for reviewing the Draft EIS. We have received your letter of November 8, 1985 and offer the following response to your comments.

1. The Figures have been modified to more clearly define the Increment II area. This area includes the entire outlined area except for the stipled portion designated Increment I.

2. - 9. The developer is currently working with the Department of Transportation Highways Division to adequately address and resolve the concerns discussed in comments 2. through 9.

10. Two boat launch facilities will be provided. Their locations within the marina will be shown in one of the figures in the Final EIS.

The storm drainage system will be designed in accordance with the City & County design standards and will include impact-type energy dissipation structures where storm drains enter the marina. In addition, a marina patrol will be employed to remove debris that may collect in the marina.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK:ob(2446A/129B:13822-001-11)

H. REFERENCES

1. Dames and Moore, "Final Groundwater Study, Proposed Ewa Marina Community, Ewa, Oahu, Hawaii, for MSM & Associates, Inc.", Dames and Moore Job No. 13822-002-11, April, 1986.

2. Kaku Associates, "Traffic Study for the Ewa Marina Community, Oahu, Hawaii prepared for MSM & Associates, Inc.", March, 1986.

3. Moffatt & Nichol, Engineers, "Littoral Processes for the Ewa Marina Community Development, prepared for MSM & Associates", March 20, 1986.

4. Moffatt & Nichol, Engineers, "Tsunami Effects on the Ewa Marina Community Development, prepared for MSM & Associates", March 20, 1986.

5. Moffatt & Nichol, Engineers, "Water Quality Analysis for the Ewa Marina Community Development, prepared for MSM & Associates", April 22, 1986.

I. LIST OF PARTIES RECEIVING THE DRAFT ADDENDUM

STATE AGENCIES

Department of Accounting and General Services
Department of Agriculture
Department of Defense
Department of Education
Department of Health
Department of Land & Natural Resources
Department of Planning & Economic Development
DPED Library
Department of Social Services & Housing
Department of Transportation
Office of Environmental Quality Control
State Archives
State Energy Office

CITY & COUNTY OF HONOLULU

Board of Water Supply
Building Department
Department of General Planning
Department of Housing and Community Development
Department of Land Utilization
Department of Parks & Recreation
Department of Public Works
Department of Transportation Services
Fire Department
Municipal Reference and Records Center
Police Department

UNIVERSITY OF HAWAII

Environmental Center
Marine Programs
Water Resources Research Center

FEDERAL AGENCIES

Army-DAFE (Facilities Eng.-USASCH)
Navy
Soil Conservation Service
U.S. Army Corps of Engineers
U.S. Coast Guard
U.S. Fish & Wildlife Service
U.S. Geological Survey

NON-GOVERNMENTAL AGENCIES

American Lung Association
Hawaiian Electric Company, Inc.
Office of Hawaiian Affairs
Oahu Sugar Company
Ewa Neighborhood Board No. 23

NEWS MEDIA

Honolulu Star-Bulletin
Honolulu Advertiser
Sun Press

LIBRARIES

U. H. Hamilton Library, Hawaiian Collection
Legislative Reference Bureau
State Main Library
Kaimuki Regional Library
Kanehoe Regional Library
Pearl City Regional Library
Hilo Regional Library
Wailuku Regional Library
Lihue Regional Library
Ewa Beach Community-School Library

J. COMMENTS ON THE DRAFT ADDENDUM

The agencies listed below commented on the Draft Addendum. Their comments and Dames and Moore's responses are presented on the following pages in the order they appear on the list.

STATE AGENCIES
- Department of Accounting and General Services
- Department of Agriculture
- Department of Defense
- Department of Education
- Department of Health
- Department of Land & Natural Resources
- Department of Planning & Economic Development
- Department of Transportation

CITY & COUNTY OF HONOLULU
- Board of Water Supply
- Building Department
- Department of General Planning
- Department of Housing and Community Development
- Department of Land Utilization
- Department of Public Works
- Department of Transportation Services
- Fire Department
- Police Department

UNIVERSITY OF HAWAII
- Environmental Center
- Water Resources Research Center

FEDERAL AGENCIES
- Navy
- Soil Conservation Service
- U.S. Coast Guard
- U.S. Fish & Wildlife Service

NON-GOVERNMENTAL AGENCIES
- Hawaiian Electric Company, Inc.
- Oahu Sugar Company

(P)1701.6

JUN 27 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Subject: Ewa Marina Community Increment II
Honouliuli, Ewa, Oahu

We have reviewed the subject documents and have no comments to offer.

Very truly yours,

T. Tominaga

TEUANE TOMINAGA
State Public Works Engineer

SM:jas
cc: Ms. Jennifer J. Kleveno

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-5185
Cable Address: DAMEMOORE

July 7, 1986

Mr. Teuane Tominaga
State Public Works Engineer
State of Hawaii
Department of Accounting and General Services
1151 Punchbowl Street
Honolulu, Hawaii 96813

DA 24

Dear Mr. Tominaga:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 27, 1986 and understand that you have no comments on the Draft Addendum. Thank you for responding.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3143B/154B(24):13822-001-11)

GEORGE R. ARIYOSHI
GOVERNOR

JACK K. SUWA
CHAIRMAN, BOARD OF AGRICULTURE

SUZANNE D. PETERSON
DEPUTY TO THE CHAIRMAN

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822

June 23, 1986

DAMES & MOORE HONOLULU
JUN 25 1986
ROUTE TO: DA17

MEMORANDUM

To: Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu

Subject: Draft Addendum to the Final Environmental Impact Statement (EIS) for Ewa Marina Community Increment II
TMK: 9-1-12: 7-17, por. 2, 5 and 6 Ewa, Oahu
Acres: 460.2

The Department of Agriculture has reviewed the subject documents and has the following comments to offer.

We understand that this Draft Addendum provides information on four issues determined to be inadequate by the Department of Land Utilization (DLU) in the Final EIS submitted to the DLU on December 9, 1985.

This Draft Addendum, along with the Supplemental Draft EIS documents, generally addresses our Department's concerns found in our memorandum to you of November 7, 1985. These concerns included questions about groundwater usage and changes in groundwater salinity, and their impacts on agriculture. Salinity readings in mg/l of chloride are included in Tables 8 and 9 (Draft Addendum EIS, pages 43, 46); however, the salinity level considered to be significant in terms of negative impacts on affected agricultural production is not stated and should be included in the final version of this EIS. The Draft Addendum states that the increase in salinity (chlorides and nitrates) is due to drip irrigation and the resultant accumulation of chlorides in the soil.

Thank you for the opportunity to comment.

Jack K. Suwa
JACK K. SUWA
Chairman, Board of Agriculture

cc: Ms. Jennifer J. Kleveno
OEQC

"Support Hawaiian Agricultural Products"

Dames & Moore

1144 10th Avenue, Suite 201
Honolulu, Hawaii 96816
(808) 735-3581
Cable Address: DAMEMORE

July 7, 1986

Mr. Jack K. Suwa
Chairman, Board of Agriculture
State of Hawaii
Department of Agriculture
1428 South King Street
Honolulu, Hawaii 96814

DA 17

Dear Mr. Suwa:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 23, 1986 and offer the following response to your comments:

The salinity level considered to be significant in terms of negative impacts on the affected agriculture production is difficult to precisely state. One thousand parts per million chloride is generally used as a limiting level for irrigation water. However, salinity levels below this, we understand, result in decreased yields, with the yield reduction somewhat proportionate to the chloride level.

Yours very truly,

DAMES & MOORE

Original signed by

Masanobu R. Fujioka, P.E.
Certified Professional Hydrologist #107
American Institute of Hydrology

MRF:lkl(3143B/1548(17):13822-001-11)

DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816-4495

MAY 28 1986

HIENG

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Ewa Marina Community Increment II
Honouliuli, Ewa, Oahu

Thank you for providing us the opportunity to review the above subject project.

We have no comments to offer at this time regarding this project.

Yours truly,

signed

Jerry M. Matsuda
Major, Hawaii Air
National Guard
Contr & Engr Officer

Enclosure

cc: Dames and Moore

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-3585
Cable Address: DAMEMORE

June 13, 1986

Mr. Jerry M. Matsuda
Major, Hawaii Air National Guard
Contr & Engr Officer
State of Hawaii
Department of Defense
Office of the Adjutant General
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

DA 1

Dear Mr. Matsuda:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of May 28, 1986 and understand that you have no comments on the Draft Addendum. Thank you for your prompt response.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3109B/154B(1):13822-001-11)

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

FRANCIS M. HATANAKA
SUPERINTENDENT

DAMES & MOORE HONOLULU
JUN 12 1986
ROUTE TO: DA 6

OFFICE OF THE SUPERINTENDENT

June 5, 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

SUBJECT: Ewa Marina Community, Increment II

Our review of the subject project indicates that the following student enrollment may be generated:

SCHOOL	GRADES	APPROXIMATE ENROLLMENT
Ewa Beach Elementary Pohakea Elementary Kaimiloa Elementary	K-6	270 - 500
Ilima Intermediate	7-8	70 - 120
Campbell High	9-12	130 - 240

Both Ilima Intermediate and Campbell High schools have sufficient capacity to accommodate the projected secondary level students. Ewa Beach, Pohakea, and Kaimiloa Elementary schools jointly have sufficient capacity to accommodate the elementary level students.

Should you have any questions, please contact Mr. Richard Inouye at 737-4743.

Sincerely,

Francis M. Hatanaka
Superintendent

FMH:jl (MRI)

cc OBS
W. Araki, Leeward Dist.
J. Kleveno

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-3585
Cable Address: DAMEMORE

June 13, 1986

Mr. Francis M. Hatanaka
Superintendent
State of Hawaii
Department of Education
P. O. Box 2360
Honolulu, Hawaii 96804

DA 6

Dear Mr. Hatanaka:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 5, 1986 and understand that the elementary, intermediate, and high schools in the area will be able to accommodate student enrollment generated by the Ewa Marina Community. Thank you for commenting on the Draft Addendum.

Yours very truly,

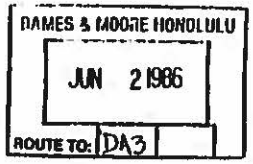
DAMES & MOORE

Jennifer J. Kleveno

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3109B/156B(6):13822-001-11)

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII



LESLIE S. MATSUBARA
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HAWAII 96801

In reply, please refer to:
EPHSO

May 30, 1986

MEMORANDUM

To: Mr. John P. Whalen, Director
Department of Land Utilization, City & County of Honolulu

From: Deputy Director for Environmental Health

Subject: Request for Comments on the Draft Addendum to the Final EIS for Ewa Marina Community Increment II

Thank you for allowing us to comment on the subject EIS application.

On a minor note, page 23 mentions that the State water quality standards are given in Chapter 37-A of the Public Health Regulations. The proper reference is Title 11, Chapter 54, Water Quality Standards.

JAMES K. IKEDA

cc: Ms. Jennifer J. Kleveno ✓

Dames & Moore

1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-3585
Cable Address: DAMEMORE

June 13, 1986

Mr. James K. Ikeda
Deputy Director for Environmental Health
State of Hawaii
Department of Health
P. O. Box 3378
Honolulu, Hawaii 96801

DA 3

Dear Mr. Ikeda:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of May 30, 1986 commenting on the Draft Addendum and have corrected page 23 to reflect the proper reference. Thank you for pointing out the discrepancy.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3109B/154B(3):13822-001-11)

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P O BOX 621
HONOLULU, HAWAII 96809

JUN 27 1986 REF. NO.: CPO-0592

DAMES & MOORE HONOLULU
JUN 30 1986
ROUTE TO DA22

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Subject: Comments on the Draft Addendum to the Final Environmental Impact Statement (EIS) for the Ewa Marina Community Increment II at Ewa, Oahu, Hawaii

We have reviewed the subject document and offer the following comments.

Our comments on the Final EIS (comments dated 12/13/85) included inadequate marine habitat description and questionable disposition of submerged lands.

The marine habitat study in this subject document adequately assessed resources present in the area. However, the Addendum includes certain conclusions that, although not critical to assessment of impact, appear questionable. For example, conclusion that neither alignment area is significant appears inconsistent with observations that a nearshore area on the west alignment supports "a number of commercially-important fish species" (pg. 37 of the Addendum); offshore along this alignment , we have observed habitat appearing potentially productive of the he'e (octopus). Thus in terms of habitat quality, the west alignment should consider this more productive than the eastern alignment; selection of an alignment should consider this factor.

The Addendum also states that vertical relief resulting from channel excavation could offset the loss of available cover (pg. 35). Such anticipated benefits seem questionable since no such fishes, invertebrates, or other fauna have been recruited yet to similar relief along the nearby channel of the Barbers Point harbor, where artificial relief exceeds 20 feet in height.

With respect to the water quality in the marina, the Addendum claims no significant impact since "source" waters already exceed some State water quality values on the basis of values measured near Ewa Beach Park. However, the Park area is influenced by waters emanating from Pearl Harbor, and by effluent from private sewage treatment plants (in residential Ewa Beach) which reaches the sea through flood control canals. The project is at least three miles west of Ewa Beach Park area, thus the comparison and assessment are highly questionable. More properly, impact should be assessed on the basis of conditions actually existing at the project area.

The ground water hydrology section of this Draft Addendum is based on a study by Dames and Moore entitled Final Groundwater Study, Proposed Ewa Marina, Ewa, Oahu, Hawaii. As indicated in our attached letter to the Corps of Engineers (see attached), we found that the study does not conclusively and definitely show how the proposed project will affect nearby existing irrigation wells of Oahu Sugar Co. Also, as stated in the report, the construction of the proposed marina will in effect bring the ocean closer to the aquifer being utilized and this will increase the risk of contamination of the aquifer by ocean water.

We appreciate the opportunity to comment on this document. Should you have any questions regarding this matter, please feel free to contact our Office of Conservation and Environmental Affairs in Honolulu, at 548-7837.

Very truly yours,

SUSUMU ONO, Chairperson
Board of Land and Natural Resources

cc: Dames and Moore
OEQC

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-1185
Cable Address: DAMEMORE

July 7, 1986

Mr. Susumo Ono, Chairman
Board of Land and Natural Resources
State of Hawaii
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

DA 22

Dear Mr. Ono:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 27, 1986 and offer the following response to your comments:

Marine Habitat

As stated in the Draft Addendum, avoiding the beachrock formation near shore along the West Channel Alignment would minimize benthic impacts since a number of commercially important fish species occur in the area. This has been considered in selection of an alignment; however, it is our opinion, and that of AECOS, that differences between the reef areas of the East and West alignments are not sufficient to base the selection of channel location primarily on biological considerations. Although local differences occur in reef assemblages, as a general observation, the entire survey area was remarkably similar in composition.

It is difficult to tell at this point what vertical relief will result from channel excavation and if fish or invertebrates will populate the channel area. A variety of factors determine how well a dredged area recovers including water quality and water movement. You mentioned that fauna have not yet been recruited to the Barbers Point harbor channel; however, after dredging at the Reef Runway, the steep seaward margin of the new borrow pit developed into a complex community attracting adult reef fishes previouley occurring not at all or in low abundance on the reef flats. (See Post Construction Water Quality, Benthic Habitat and Epifauna Survey for the Reef Runway, Honolulu International Airport Final Report. Part B: Benthic Biology, AECOS 1979. Appendix C in: Honolulu International Airport Reef Runway Post Construction Environmental Impact Report, Vol. 2. Technical Report prepared by Parsons Hawaii for Department of Transportation Air Transportation Facilities Division, State of Hawaii.)

Water Quality

One must presume, in lieu of an exact site-specific water quality data, that source waters for the Ewa Marina shall be the nearshore coastal zone waters (out to perhaps a few 100 meters from shore) up-and down-coast from the site. Since the nearest Department of Health (DOH) sampling site is at Ewa Beach Park, the data there was used as representing the "Ewa Beach Coastal Zone".

There could be "elevated nutrient levels" at the Ewa Beach site due to residential Sewage Treatment Plant effluents and water from the Pearl Harbor entrance moving along shore; however, the sampling site by the DOH was about 100 yards offshore, so that the land drainage effects should be substantially diluted. Further, one would expect that if water at Ewa Beach Park is influenced by Pearl Harbor, water at the proposed Ewa Marina project site would be influenced by the Ewa Beach Park site, since surf and wind mix the shallow coastal zone water and tidal currents likely flow in reversing patterns along shore. We believe that the Ewa Beach water quality data of DOH are not greatly different than values expected at the project site (i.e. are within a factor of $\pm$ 50 to 100 percent).

Groundwater

The groundwater study has clearly shown how Oahu Sugar's mode of operation has much more effect on groundwater quality and heads then other factors, such as construction of the marina. The study has determined that head changes are very small and due to decreases in the flow length rather than flow quantity, that groundwater flow is not decreased, and that groundwater quality at Oahu Sugar's well sites would not be degraded. In fact, we believe that because the development will be withdrawing less water from EP24 wells than Oahu Sugar currently does, groundwater quality at Oahu Sugar's remaining wells could be positively affected by the development. This positive effect, however, is likely to be overwhelmed by groundwater quality degradation due to Oahu Sugar's past, present, and possible future operations.

Constuction of the marina would bring the shoreline closer to the existing wells, but would not result in increased contamination.

Yours very truly,

DAMES & MOORE

Jennifer J. Klevens

Jennifer J. Klevens
Assistant Environmental Scientist

JJK(3143B/154B(22):13822-001-11)

DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

KAMAMALU BUILDING, 250 SOUTH KING ST., HONOLULU, HAWAII
MAILING ADDRESS: P.O. BOX 2359, HONOLULU, HAWAII

GEORGE R. ARIYOSHI, GOVERNOR
KENT M. KEITH, DIRECTOR
MURRAY E. TOWILL, DEPUTY DIRECTOR
LINDA KAPUNIAI ROSEHILL, DEPUTY DIRECTOR

DIVISIONS:
BUSINESS AND INDUSTRY DEVELOPMENT DIVISION
ENERGY DIVISION
FOREIGN TRADE ZONE DIVISION
LAND USE DIVISION
PLANNING DIVISION
RESEARCH AND ECONOMIC ANALYSIS DIVISION

OFFICES:
DIRECTOR'S OFFICE
ADMINISTRATIVE SERVICES OFFICE
INFORMATION OFFICE

Ref. No. P-1[illegible]

June 20, 1986

The Honorable John P. Whalen
Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Subject: Draft Addendum to the Final EIS for Ewa Marina Community - Increment II

We have reviewed the subject draft addendum and have the following comments to offer.

1. It is our understanding that the developer, [illegible] & Associates, is proposing a new alignment to the channel entrance of Ewa Marina which is 300 yards west of the original entrance. The newly proposed entrance is called the West Entrance.

2. The new West Entrance alternative would eliminate the impact to Oneula Beach Park and would significantly reduce adverse effects to the existing surf sites. However, some of the problems include a longer flushing cycle for the marina, an increased travel time within the marina, increased land and dredging costs and increased automobile traffic in certain areas.

3. According to testimony at the State Land Use Commission hearing on the subject project, there is a future option to expand to the north on 389.4 acres in Phase II. The current Phase I project is proposed for 707.6 acres in two increments.

4. The addendum to the Final EIS should fully explore various configurations for the marina with possible expansion plans to the north on the additional 389.4 acres. The flexibility gained by using these lands to the north could eliminate flushing problems, have a positive effect on marina travel time, reduce development costs and improve internal project traffic.

JUN 24 1986

5. The West Entrance channel (formerly alternative No. 3) to the proposed marina appears acceptable since it would not destroy the "sand tracks" surfing site as would the East Entrance--the previously preferred alternative.

6. The final EIS Addendum should include discussion on potential impacts, if any, that may result from the new West Entrance configuration.

Thank you for the opportunity to review and comment on the subject documents.

Very truly yours,

Murray E. Towill

for Kent M. Keith

cc: Ms. Jennifer J. Aleveno
Dames and Moore
Office of Environmental Quality Control

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-1585
Cable Address: DAMEMORE

July 7, 1986

Mr. Kent M. Keith
Director
State of Hawaii
Department of Planning and Economic Development
P. O. Box 2359
Honolulu, Hawaii 96804

DA 13

Dear Mr. Keith:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 20, 1986 and offer the following response to your comments:

1. Your understanding is correct.

2. The flushing times for the West Entrance marina layout are only slightly longer than those for the East. As stated on page 18 of the Addendum, keeping the West entrance aligned with the wind will tend to increase the exchange flow between the marina and the ocean, since the surface current driven by the trade wind can continue straight out to sea. This could compensate for the slightly longer residence time in the West Entrance layout.

   Increased automobile traffic through certain areas is not considered a significant problem because roads and parking will be designed to accommodate the traffic.

3. Your statement is correct.

4. The developer has explored various marina configurations with possible expansion plans to the north; however, this Final Supplementary EIS and its Addendum deal only with Phase I, Increment II and, therefore, we cannot, at this time, present alternatives out of the proposed project boundaries.

6. We believe that Chapter D of the Addendum addresses potential impacts that may result from the new West Entrance. The Final EIS together with the Addendum address impacts that would result from construction of the entire Ewa Marina Community.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3143B/154B(13):13822-001-11)

4271
STP 8.1427

July 1, 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Draft Addendum to FEIS
Ewa Marina Community, Increment II
Ewa, Oahu

The developers for the subject proposal have been coordinating this matter closely with us. While we have no comments on the draft addendum, we will continue to work with them as the project progresses. They will be notified should we have any future concerns or comments.

We apologize for this late response.

Very truly yours,

Wayne J. Yamasaki
Director of Transportation

DT:ko

cc: DEP-H, HWY, HAR, STP(dt)
√ Ms. Jennifer J. Kleveno, Dames & Moore

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-3585
Cable Address: DAMEMORE

July 7, 1986

Mr. Wayne J. Yamasaki
Director of Transportation
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

DA 23

Dear Mr. Yamasaki:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of July 1, 1986 and understand that you have no comments on the Draft Addendum. Thank you for responding.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3143B/154B(23):13822-001-11)

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

DAMES & MOORE HONOLULU
JUN 4 1986
ROUTE TO: DA4

June 2, 1986

TO: JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: DRAFT ADDENDUM TO THE FINAL ENVIRONMENTAL IMPACT STATEMENT (EIS) AND APPENDIX FOR EWA MARINA COMMUNITY, INCREMENT II

Thank you for the opportunity to review the revised environmental document for the proposed project.

The environmental document adequately addresses our concerns on groundwater resources.

If you have any questions, please contact Lawrence Whang at 527-6138.

For KAZU HAYASHIDA

cc: Ms. Jennifer Kleveno
Dames and Moore

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-3585
Cable Address: DAMEMORE

June 13, 1986

Mr. Kazu Hayashida
Manager and Chief Engineer
City and County of Honolulu
Board of Water Supply
630 South Beretania Street
Honolulu, Hawaii 96813

DA 4

Dear Mr. Hayashida:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 2, 1986 and understand that you have no comments on the Draft Addendum. Thank you for your prompt response.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3109B/154B(4):13022-001-11)

DAMES & MOORE HONOLULU

JUN 2 1986

SITE ID: DA2

PB 86-428

May 29, 1986

MEMO TO: MR. JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: HERBERT K. MURAOKA
DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: EWA MARINA COMMUNITY INCREMENT II
DRAFT ADDENDUM TO FINAL EIS

We have reviewed the Draft Addendum to the Final Environmental Impact Statement for Ewa Marina Community Increment II and have no comments.

Thank you for the opportunity to review the draft addendum.

HERBERT K. MURAOKA
Director and Building Suporintendent

TH:jo
cc: Dames & Moore
J. Harada

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735 3585
Cable Address: DAMEMORE

June 13, 1986

Herbert K. Muraoka
Director and Building Superintendent
City and County of Honolulu
Building Department
650 South King Street
Honolulu, Hawaii 96813

DA 2

Dear Mr. Muraoka:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of May 29, 1986 and understand that you have no comments on the Draft Addendum. Thank you for your prompt response.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3109B/154B(2):13822-001-11)

DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU HAWAII 96813

FRANK F. FASI
MAYOR

DONALD A. CLEGG
CHIEF PLANNING OFFICER

GENE CONNELL
DEPUTY CHIEF PLANNING OFFICER

WL/DGP 5/86-8605

June 18, 1986

DAMES & MOORE HONOLULU
JUN 19 1986
ROUTE TO: DAP

MEMORANDUM

TO: JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

SUBJECT: REVIEW OF THE DRAFT ADDENDUM TO THE FINAL ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR EWA MARINA INCREMENT II

This is in response to your request for comments on the addendum to the Final EIS for Ewa Marina Increment II.

In our review of the report, it is noted that on page 59 the applicant states:

> "As jointly agreed upon by the developer's traffic consultant and by the State Department of Transportation's Highway Division, the proposed North-South Road is not required for Phase I of the project and will, therefore, be addressed in detail during Phase II. Since the EIS and this Addendum encompass only Phase I, Increment II of the Ewa Marina project, it is not necessary to evaluate the details of the proposed North-South Road at this time."

In the Adequacy of Public Services and Facilities Section of the DECISION and ORDER of the State Land Use Commission for the boundary change for Ewa Marina dated September 21, 1984, there is the following statement:

> "60. In making its traffic analysis, PRC Voorhees assumed that a second four-lane highway along a north-south corridor, designed to interstate standards, in addition to Fort Weaver Road would be completed prior to the commencement of Phase II."

In light of this, we feel that the NORTH-SOUTH Road should be considered during the rezoning of Phase I, Increment II, because of the impact of the additional traffic in the Ewa Beach area and the applicant's assumption that the roadway would be completed before the processing of Phase II.

Thank you for giving us an opportunity to comment on this matter.

Donald Clegg

DONALD A. CLEGG
Chief Planning Officer

cc: Ms. Jennifer J. Kleveno
Assistant Environmental Scientist
Dames and Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813
PHONE 523-4181

FRANK F. FASI
MAYOR

ALVIN K.H. PANG
DIRECTOR

June 20, 1986

DAMES & MOORE HONOLULU
JUN 25 1986
ROUTE TO: DA16

MEMORANDUM

TO: John P. Whalen, Director
Department of Land Utilization

FROM: Alvin K. H. Pang

SUBJECT: Draft Addendum to the Final EIS
Ewa Marina Community - Increment II

Thank you for the opportunity to review the draft addendum for the Ewa Marina Community, Increment II.

We understand that the applicant has prepared the final addendum to address the deficiencies of:

- Alternative channel alignments;
- Marine benthic habitat;
- Groundwater hydrology; and
- Roads and traffic.

Although the subject addendum does not mention the executed unilateral agreement with Ewa Marina Development, DHCD has been meeting with the developer to facilitate the plans to meet the unilateral requirements.

We will retain the EIS report in our files.

for ALVIN K. H. PANG

cc: Dames and Moore

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-1585
Cable Address: DAMEMORE

July 7, 1986

Mr. Donald A. Clegg
Chief Planning Officer
City and County of Honolulu
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

DA 9

Dear Mr. Clegg:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 10, 1986 and offer the following response to your comments:

Enclosed, for your information, is recent correspondence between the State Department of Transportation (DOT) and the developer regarding the Final Traffic Study for the Ewa Marina Community. The developer has agreed to update the Ewa Marina Traffic Study at least every three years commencing three years following completion of the first residential unit. These updated studies will address necessary highway improvements, including the North-South Road, and will be coordinated with and approved by the State DOT and the City Department of Transportation Services.

The Appendix to the Final Addendum contains the attached correspondence and the March 1986 Traffic Study by Kaku Associates. We appreciate your comments on the Draft Addendum.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3143B/154B(9):13822-001-11)

Enclosures

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-3581
Cable Address: DAMEMORE

July 7, 1986

DA 16

Mr. Alvin K. H. Pang
Director
City and County of Honolulu
Department of Housing and Community Development
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Pang:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 20, 1986 and offer the following response to your comments:

Although the Addendum does not mention the unilateral agreement, the developer will continue to meet with DHCD to facilitate the plans in meeting the agreement.

Thank you for commenting.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3143B/154B(16):13822-001-11)

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4432

FRANK F. FASI
MAYOR

JOHN P. WHALEN
DIRECTOR

June 23, 1986

(RF)

DAMES & MOORE HONOLULU
JUN 24 1986
ROUTE TO: DAH

Ms. Jennifer J. Kleveno
Dames and Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816

Dear Ms. Kleveno:

Draft Addendum to the Supplemental
Environmental Impact Statement (SEIS)
For the Proposed Ewa Marina Community
Increment II, Honouliuli, Ewa, Oahu

We have reviewed the Draft Addendum and have the following comments to offer:

1. Section D. Alternative Channel Alignments

   You have apparently revised your study of tsunami effects on the marina. What effect will this have on your land use plan - specifically, setbacks and elevations for habitable structures fronting the waterways?

2. Section F. Roads and Traffic

   a. The Addendum makes reference to a March 1986 traffic study by Kaku & Associates. This study should be included as an appendix to the document.

   b. Has the State Department of Transportation (DOT) accepted the Kaku & Associates study as an adequate traffic impact analysis?

   c. The Addendum states that the DOT has agreed with the developer that the North-South Road will not be required prior to completion of Phase I (page 57). Does this agreement take into consideration all other projects in the area for which zoning has been approved? Does it consider the completion of those projects and the total cumulative impact on traffic?

   d. What criteria will the DOT use to determine the need for the North-South Road and the timing of its construction?

If you have any questions regarding the above, please contact Mr. Robin Foster of our staff at 527-5027.

Very truly yours,

JOHN P. WHALEN
Director of Land Utilization

JPW:sl
02008

cc: Department of Transportation

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-3185
Cable Address: DAMEMORE

July 7, 1986

Mr. John P. Whalen
Director of Land Utilization
City and County of Honolulu
Department of Land Utilization
650 South King Street
Honolulu, Hawaii 96813

DA 11

Dear Mr. Whalen:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 23, 1986 and offer the following response to your comments:

1. Section D. Alternative Channel Alignments

Design criteria for areas surrounding the marina will be based on the projected tsunami elevations. The previously established setbacks will allow for the revised elevation; therefore, the land use plan will not be affected.

2. Section F. Roads and Traffic

a. The March 1986 Traffic Study has been included as Appendix 7 in the Final Addendum. Also included in Appendix 7 is recent correspondence between the developer and the State Department of Transportation (DOT).

b. Please refer to the attached letters which are included in Appendix 7. In the letter of July 1, 1986, the developer has requested that DOT approve the Traffic Study.

c. The agreement does take into consideration all other projects for which zoning has been approved, and it does consider the completion of those projects and the total cumulative impact on traffic.

d. As presented in the attached letters, the developer will, at his expense, update the Ewa Marina Traffic Study at least every three years commencing three years following completion of the first residential unit. These traffic studies will be coordinated with and

approved by the State DOT and the City Department of Transportation Services, and will be the criteria used to determine necessary highway improvements.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3143B/154B(11):13822-001-11)

Enclosures

DAMES & MOORE

JUN 16 1986

ROUTE TO: DA7

EPV 86-137

June 9, 1986

MEMORANDUM

TO: MR. JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: RUSSELL L. SMITH, JR., DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

SUBJECT: DRAFT ADDENDUM TO FEIS, EWA MARINA COMMUNITY, INCREMENT II, HONOULIULI, EWA, OAHU

We have reviewed the Draft Addendum to the FEIS for the subject project and have no additional comments to offer.

RUSSELL L. SMITH, JR.
Director and Chief Engineer

cc: Dames and Moore

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-3585
Cable Address: DAMEMORE

June 27, 1986

Mr. Russell L. Smith, Jr.
Director and Chief Engineer
City and County of Honolulu
Department of Public Works
650 South King Street
Honolulu, Hawaii 96813

DA 7

Dear Mr. Smith:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 9, 1986 and understand that you have no additional comments to offer. Thank you for reviewing the Draft Addendum.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3109B/154B(7):13822-001-11)

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

JOHN E. HIRTEN
DIRECTOR

JOSEPH M. MAGALDI, JR.
DEPUTY DIRECTOR

TE-2684
PL 1.0329

June 23, 1986

JUN 27 1986
ROUTE TO DA 18

MEMORANDUM

TO: JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: JOHN E. HIRTEN, DIRECTOR

SUBJECT: EWA MARINA COMMUNITY - INCREMENT II
DRAFT ADDENDUM TO THE FINAL
ENVIRONMENTAL IMPACT STATEMENT (EIS)
TMK: 9-1-12: 7-17, POR. 2, 5 AND 6

This is in response to OEQC's letter of May 21, 1986. In addition to and in reiteration of our comments dated November 13, 1985 on the Draft EIS, we have the following comments on the Draft Addendum to the Final EIS:

1. Sharp horizontal curves along Road "A" should be eliminated and the roadway realigned into portions of Phase II to increase the overall safety of the facility;

2. The radii of the horizontal curves located at the ends of the two major roadways appear unacceptable and should be designed to conform with accepted design standards;

3. The layout of the North/South Road intersection with the Ewa Marina Development should be included to clarify the location and the proposed design of the intersection.

If you have any questions, please contact Kenneth Hirata of my staff at local 5009.

(for) JOHN E. HIRTEN

cc: √Ms. Jennifer J. Kleveno
Dames & Moore

Dames & Moore

1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-3585
Cable Address: DAMEMOORE

July 7, 1986

Mr. John E. Hirten
Director
City and County of Honolulu
Department of Transportation Services
650 South King Street
Honolulu, Hawaii 96813

DA 18

Dear Mr. Hirten:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 23, 1986 and offer the following response to your comments:

1. and 2. The developer is currently looking at different alignments of Road "A". The roadway alignments shown in the Addendum are preliminary and are subject to the approval of your department.

3. The March 1986 Traffic Study for the Ewa Marina Community is included in the Final Addendum in Appendix 7. This study shows the location and the proposed design of the intersection. At a later date, the designs will be incorporated into construction drawings which will be subject to your review and approval.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3143B/154B(18):13822-001-11)

FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

1455 S BERETANIA STREET ROOM 305
HONOLULU HAWAII 96814

FRANK F. FASI
MAYOR

FRANK K. KAHOOHANOHANO
FIRE CHIEF

LIONEL E. CAMARA
DEPUTY FIRE CHIEF

July 23, 1986

TO : JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM : FRANK K. KAHOOHANOHANO, FIRE CHIEF

SUBJECT: EWA MARINA COMMUNITY INCREMENT II
DRAFT ADDENDUM TO FINAL EIS

We have reviewed the subject draft addendum and wish to note that the Ewa Marina will receive fire protection from the Ewa Beach Fire Station engine company with additional service provided by engine and ladder companies from the Waipahu Fire Station.

We are planning to relocate the Ewa Beach Fire Station to a more suitable site and have met with Campbell Estate representatives regarding the matter. Relocation of the existing fire station will provide more centralized fire protection for the Ewa Beach community and enhance coverage for the proposed Marina.

We also project an additional station in the proposed Ewa Tenny Village. Existing fire protection is considered adequate for the Ewa Marina Project.

Should you have any questions, please contact Battalion Chief Kenneth A. Word at 943-3838.

FRANK K. KAHOOHANOHANO
Fire Chief

FKK:KAW:sb

cc: Mrs. Jennifer J. Kleveno
Assistant Environmental Scientist
Dames and Moore

JUN 24 1986

DN2

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-1185
Cable Address: DAMEMORE

June 27, 1986

Mr. Frank K. Kahoohanohano
Fire Chief
City and County of Honolulu
Fire Department
1455 South Beretania Street Room 305
Honolulu, Hawaii 96814

DA 12

Dear Mr. Kahoohanohano:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 23, 1986 and understand that existing fire protection is considered adequate for the Ewa Marina Community. Thank you for informing us of the plans for future fire protection. Your letter will be included in the Final Addendum.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3109B/154B(12):13822-001-11)

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

1455 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96814 - AREA CODE (808) 548-2555

FRANK F. FASI
MAYOR

DOUGLAS G. GIBB
CHIEF

WARREN FERREIRA
DEPUTY CHIEF

OUR REFERENCE BC-JS

DAMES & MOORE
JUN 4 1986
ROUTE TO: DAS

June 2, 1986

TO: JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: DOUGLAS G. GIBB, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

SUBJECT: EWA MARINA COMMUNITY INCREMENT II

Thank you for providing us with a copy of the Draft Addendum to the Final Environmental Impact Statement and its associated Appendix for the Ewa Marina Community Increment II. The Honolulu Police Department has no comment in regard to the addendum.

DOUGLAS G. GIBB
Chief of Police

✓ cc: Ms. Jennifer J. Kleveno
Assistant Environmental Scientist
Dames and Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816

Dames & Moore

1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-3585
Cable Address: DAMEMORE

June 13, 1986

Mr. Douglas G. Gibb
Chief of Police
City and County of Honolulu
Police Department
1455 South Beretania Street
Honolulu, Hawaii 96814

DA 5

Dear Mr. Gibb:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 2, 1986 and understand that you have no comments on the Draft Addendum. Thank you for your prompt response.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3109B/154B(5);13822-001-11)

2ND CORRECTION
(P. 2, para. 2)
06-25-86

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

June 19, 1986
(RE: 0427)

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Draft Addendum
Final Environmental Impact Statement
Ewa Marina Community Increment II
Ewa, Oahu

We have reviewed the above cited document, which has been prepared to address the deficiencies cited by the City and County of Honolulu Department of Land Utilization as reasons for not accepting the Final EIS. Our review was prepared with the assistance of Paul Ekern, Soils and Agronomy; Stephen Smith, Hawaii Institute of Marine Biology; Frisbee Campbell, Hawaii Institute of Geophysics; Hans-Jurgen Krock, Ocean Engineering; and Doak Cox, Martha Diaz and Walington Yee, Environmental Center.

General comments

The change from the originally proposed East Marina Entrance to the now proposed West Marina Entrance seems in the net distinctly beneficial; and, in the draft addendum, most if not all deficiencies in the earlier EIS seemed remedied. However, the following are issues which seem inadequately addressed.

Marina design

As previously stated in our response of February 10, 1986 to your comments on the earlier Center review, a hydraulic model study would be very advantageous to determine the optimum design--shape, size and orientation--of the entrance and marina basin. Consideration of this point would seem advantageous to the success of the project.

Water pollutant sources

We note that the draft addendum estimates an input to the marina waters of 2.5 lbs copper per boat from bottom paint (page 12, last paragraph; appendix 3, page 1, last paragraph). With the 1600-boat total (Figure 6) this amounts to 2 tons of copper per year (6 kg/day). It is estimated that this will result in a copper concentration of 20 to 90 mg/l in the marina (page 18, last paragraph).

It is our understanding that there is evidence of Cu toxicity at concentrations of 10 ppb, so the discharge could potentially "toxify" a volume of $\sim 6 \times 10^5$ m^3/d, outside the marina not within it. It is necessary to compare this potentially toxic water volume with the rate of water dispersal. If it is assumed that the discharge is into a "coastal circulation cell" with a one-day water residence time, the affected volume might be of the order of 6×10^5 m^3. Longshore drift, discussed in the report, is not as important a dispersal mechanism as mixing normal to coastline into deeper water. If such a circulation cell has a mean depth of 6 m, the affected area would be of the order of 10^5 m^2 (or a nominal semi-circular area around the marina mouth, with a radius of 250 m. Nevertheless, most of the Cu would probably end in the sediments within the marina, causing a problem there.

Many modern fouling paints are mixtures of Cu and organo-tin. The report cited (Young et al., 1974) does not cover more recent developments in bottom paints. Tin (Sn) release may make up 20-50 percent of the total toxin release from modern paints. The Sn is apparently more toxic than Cu, so this lower release rate is apparently more effective than the Cu release in deterring fouling. The Sn may also not be as readily bound into the sediments as Cu, so Sn may well affect an area of the order that affected by the Cu or larger. At a minimum, some attempt should be made to estimate diffusion of materials away from the coast and into deep water. A more realistic evaluation of modern antifouling paints would also seem appropriate.

Storm drainage

It has been suggested that sediment concentrations in stream flow, such as in Waikele, can reach 1000 ppm (Ekern, 1976, enclosed). If this is the case there may be a problem in reducing sediment to 100 ppm in stilling basins. Information on the effectiveness of basins to reduce Kaloi stream sediments needs to be included. USGS Water-Resources Investigations Report 85-4265, December 1985 (enclosed), probably a better source of information on urban sediment loads, points to the high variability of this factor.

Groundwater infiltration

It would be advantageous to indicate that the wells in Table 2, page 15 are the same as those cited on Table 9, page 46. On page 15, interpreting the data of a single well sample in January 1986, needs careful consideration in that the heavy fall rains of 1985 (Sep 2.36", Oct 3.35", Nov 1.54") on the Ewa plain must have affected the salt movement, especially for shallow (30 foot depth) wells. To imply that drip irrigation has played a major role in chloride changes seems precarious.

Water quality standards

The discussion presented on page 26, asserting that phosphorus as a limiting factor in the algal development of the proposed marina needs clarification. What is the basis for this assertion when current data suggests that nitrogen is the limiting factor.

Volcanic aquifer

On page 39 of the addendum, the "Volcanic Aquifer" should be identified as that in the lavas of the Koolau volcano or that in the lava of the Waianae volcano.

Existing ground water flow

More recent pan-evaporation data than that used by Dames and Moore in estimating ground-water flow (pages 44-45) are enclosed for your use (Ekern and Chang, 1985).

Existing groundwater quality

We understand that the Water Resources Research Center is providing you with comments on this section and the Dames and Moore appendix on which it is based.

Yours truly,

Doak Cox
for Jacquelin Miller
Acting Associate Director

Enclosures

cc: Dames & Moore
Patrick Takahashi
OEQC
Paul Ekern
Stephen Smith
Frisbee Campbell
Hans Krock
Doak Cox
Martha Diaz
Walington Yee

Turbidity and sediment-rating curves for streams on Oahu, Hawaii

Paul C. Ekern

The relationship between bed load and a stream's water discharge has a direct physical basis and has been correlated with mean water power as well as mean velocity (*7, 20, 34, 45, 59*). The suspended load does not have such a simple, clear, functional basis. Suspended load (wash load) has been correlated with the supply of sediment from the kinetic energy of rainfall and the resultant sheet erosion for watersheds only a few acres in size (*15, 60*). Suspended loads for small watersheds should be compared on the basis of equivalent climatic erosional hazard, soil susceptibility, and topographic features, particularly for watersheds less than 10 square miles (25.9 km^2) in area (*58*). For watersheds as great as 6,000 square miles (15,540 km^2), suspended load apparently becomes independent of the sediment supply from the rainfall kinetic energy; and other limiting bases for comparison must be sought (*37*). Since total sediment transport depends on the product of the concentration times the discharge, it is strongly biased toward a high correlation with discharge. The relationship between sediment concentration alone and stream discharge is the more sensitive index of the correspondence between the two. The relationship between suspended load transport and stream discharge has a well correlated function in the form: transport = constant x discharge^i. The exponent, *i*, (*i*-1 for concentration alone) was 2.16 for the Missouri River (*47*) and 2 to 3 for streams of the western United States (*32*). If transport and bed erosion depend on stream power per unit width, concentration should be proportional to discharge (*32*).

Direct measurement of suspended sediment concentration by filtration, drying, and weighing of samples is costly in time and manpower, hence alternative methods are often used. Unfortunately, stream sediment concentrations are usually less than the 50,000 milligrams per liter required for optimum use of the hydrometer methods (*28*). Optical properties of the suspensions have been used, particularly when relatively low concentrations must be determined both in laboratory and field measurements (*11, 27, 29, 53*).

Paul C. Ekern is an hydrologist at the Water Resources Research Center and a professor of soils at the University of Hawaii, Honolulu 96822. *Water Resources Research Center Contribution No. 87. This work was supported by the Office of Water Research and Technology, Project No. A-039-HI, and the Water Resources Research Center, University of Hawaii.*

tion for Hawaiian streams, despite a very high climatic rainfall hazard, supports the relatively low erosional susceptibility (K value of approximately 0.1) for the soils that dominate much of the Kipapa watershed (*9*).

Character of Stream Sediments

Light transmittance for measured additions of Kipapa sediments to tap water (Table 2, Figure 5) followed the expected logarithmic relationship. However, the iron oxide coatings of the red kaolinitic clay aggregates that form the major sediments in many Hawaiian streams (*16*) make the sediments highly light absorbing and give unique scatter and transmittance to the suspended load. The extinction coefficient for the Formazin turbidity standard

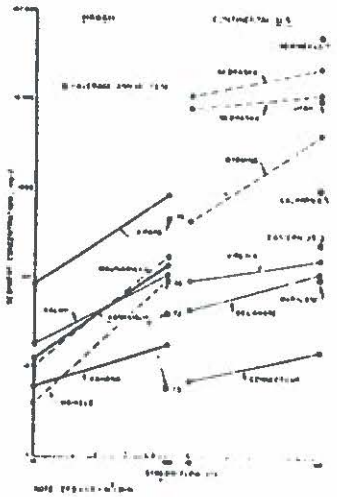


Figure 3. Sediment concentration and stream flow for Oahu compared with conterminous U.S. relationships.

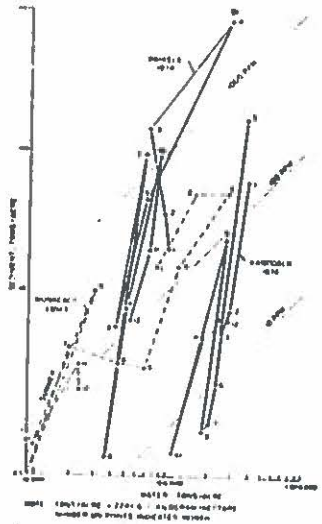


Figure 4. Sedihydrographs for Oahu streams and for a Maryland stream.

in the Hach turbidimeter is very small compared to the coefficient for these iron-coated sediments. Transmittance for montmorin clay depended largely on cation status, with high values reported for monovalent but low values for divalent saturated clays that became nonlinear above 800 mg/l for the divalent and above 2,000 mg/l for the monovalent clays (*2*). Relative transmitted intensities for a 100 mg/l concentration and 0.5-um light would be as follows: Kipapa sediments, 0.70; Ca-montmorin clay, 0.79; Na-montmorin, 0.955; Formazin, 0.897. This low transmittance of Hawaiian sediments makes them specially detrimental to light penetration and ought to require pollution standard limits with concentrations much less than those set for areas where quartz

QUALITY OF STORM-WATER RUNOFF, MILILANI TOWN, OAHU, HAWAII, 1980-84

By Cheryl M. Yamane and Marty G. Lum

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 85-4265

Prepared in cooperation with the

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

Honolulu, Hawaii

December 1985

QUALITY OF STORM-WATER RUNOFF, MILILANI TOWN, OAHU, HAWAII, 1980-84

By Cheryl M. Yamane and Marty G. Lum

ABSTRACT

Storm-water runoff and rainfall data were collected at two urban sites in Mililani Town, Oahu, Hawaii between September 1980 and August 1984. The data included results from analyses of 300 samples of storm-water runoff. Turbidity, suspended solids, Kjeldahl nitrogen, and phosphorus concentrations exceeded the State of Hawaii Department of Health's streamwater standards in more than 50 percent of the samples. Mercury, lead, and fecal coliform bacteria levels exceeded the U.S. Environmental Protection Agency's recommended criteria for either freshwater aquatic life or shellfish harvesting waters in more than half the samples. Other constituents exceeding State or Federal standards in at least one sample included pH, cadmium, nitrate plus nitrite, iron, alkalinity, manganese, chromium, copper, zinc, and the pesticides heptachlor, lindane, and malathion.

Runoff correlated well with rainfall in both basins. Antecedent rainfall conditions and rainfall intensity had little effect on the quantity of runoff.

No statistically significant relationships were found between quantity of runoff and concentration of water-quality constituents. A "first flush" effect was observed for chemical oxygen demand, suspended solids, lead, nitrate plus nitrite, fecal coliform bacteria, dissolved solids, and mercury. There were significant ($\alpha = 0.05$) differences between the two basins for values of discharge, turbidity, specific conductance, chemical oxygen demand, suspended solids, nitrate plus nitrite, phosphorus, lead, dissolved solids, and mercury. The larger basin had higher median and maximum values, and wider ranges of values.

PAN EVAPORATION:
STATE OF HAWAI'I, 1894-1983

Report R74

Prepared by
PAUL C. EKERN and JEN-HU CHANG
University of Hawaii at Manoa
WATER RESOURCES RESEARCH CENTER
Honolulu, Hawaii 96822

In Cooperation with
HAWAIIAN SUGAR PLANTERS' ASSOCIATION
Aiea, Hawaii 96701

State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Water and Land Development

Honolulu, Hawaii
August 1985

ABSTRACT

Pan evaporation measurements in Hawai'i began as early as 1894 and eventually included intermittent observations at over 200 sites, the majority with stainless steel Class A pans set on 5 ft high platforms. Sites were concentrated in the dry lowland irrigated areas but shielded evaporimeter transects extended measurements into high rainfall areas.

Evaporation at sites with 20-yr records had a nearly normal distribution for which the standard deviation decreased from nearly 30% of the mean for daily, to 15% for monthly, and to 7% of the mean of annual values.

Empirical relationships between evaporation and temperature or rainfall had only limited applicability.

The pattern of annual evaporation for each island differed from the equilibrium value of 80 in. over the ocean as patterns of cloudiness, sunlight, and rainfall changed in response to wind flow over the island topography. Beneath the tradewind orographic clouds, evaporation was 30 to 40% less than the oceanic rate, while in the dry leeward areas evaporation was 30 to 40% more than oceanic, with summer rates greater than 12 in./mo. In the dry, sunny, and windy sites above the 6000 ft tradewind inversion level, evaporation again increased to equal surface rates.

KEYWORDS: pan evaporation, evaporation pans, evaporation rate, evaporimeters, net radiation, temperature, wind; Class A pans, sunlight, Hawaii, Maui, Molokai, Lanai, Oahu, Kauai

lishes monthly and annual data in "Local Climatological Data: Hawaii and Pacific" for a series of six pan evaporation stations which began in 1919 (NOAA 1920-1983), although only three are currently in operation and data from Sta. Nos. 702.00 and 702.20 are combined as a single record. These data were summed and statistical parameters presented through 1980 in the NOAA Technical Report NWS 34 (Farnsworth and Thompson 1982). Although changes in pan composition, color, and size were acknowledged, no correction was made for these facts.

Critical attention must be paid to the history of changes in the pan composition, color, and elevation. Uncritical acceptance of NWS published data for statistical analysis of Sta. No. 702.20 (Farnsworth and Thompson 1982; Farnsworth, Thompson, and Peck 1982) actually represented a tremendous trend with time that probably was a progressive leak in the pan drainage valve (Fig. 8). In truth, evaporation remained relatively constant at nearby Sta. No. 740.50. For Sta. No. 1020.10, the shift from a painted galvanized pan to a monel pan in 1963 caused a marked increase in the measured pan evaporation, while evaporation decreased at Sta. No. 87.00 (Fig. 8).

Maps of pan station locations are presented in Appendix Figures A.1 to A.6 and a brief site description is given in Appendix Table A.1. Alternate station names which have been used over the years are in Appendix Table A.2, and an alphabetical list of current station names in Appendix Table A.3.

Evaporation records as reported for Hawai'i stations are contained in Appendix Table B.1, their statistical parameters in Appendix Table B.2, and adjusted values in text Tables 2 to 7. Probability plots of the mean annual pan evaporation for selected stations with values based on daily observations were slightly curvilinear, but where weekly data were the basis, reasonably linear values were a criterion for normal distribution (Fig. 9).

Probability plots of sunlight (1932 through 1984 for Makiki-Holmes Hall) had an apparent bimodal pattern with a cluster of values near the upper quartile during the mid-1950s to mid-1960s and another from the cluster near the lowest quartile in the 1930s and again in the 1970s (Fig. 10). Hours of bright sunlight from the period 1904 through 1983 had a more nearly linear probability plot and approach normal distribution (Fig. 11).

For a normal population, the standard deviation σ and the mean deviation μ have the relationship, $2\sigma^2/\mu^2 = \pi$. This ratio for Station No. 740.50, with 19 years of annual pan data, is 0.94 π, and suggests near normality (Conrad

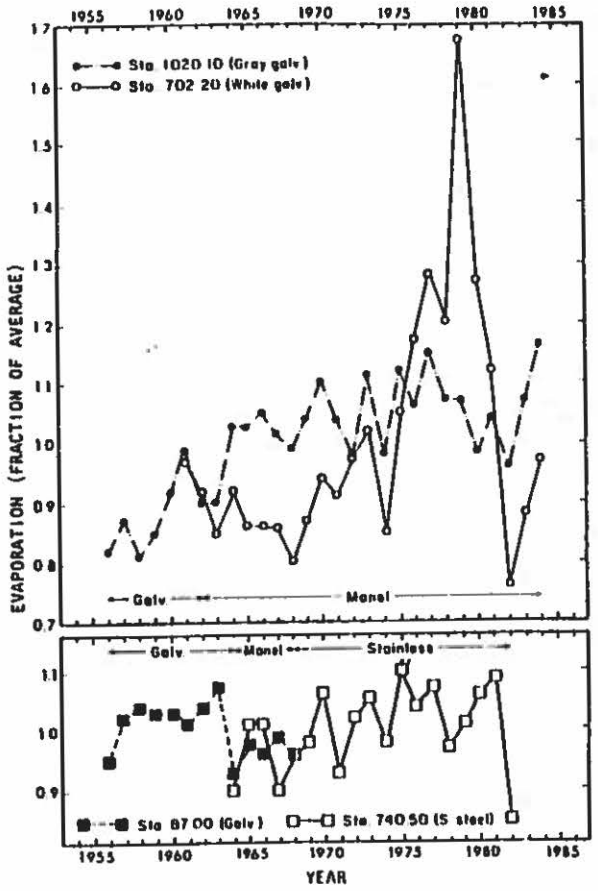


Figure 8. Evaporation trends as influenced by pan composition and color

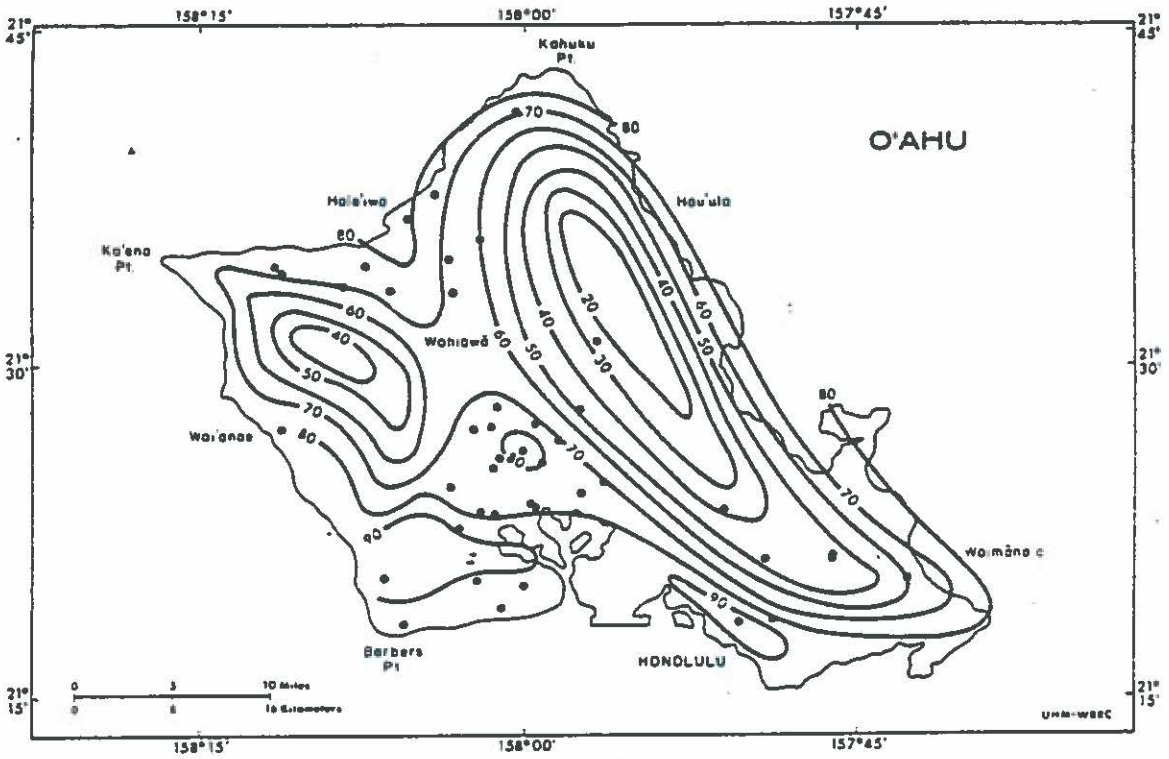


Figure 14. Adjusted annual pan evaporation for O'ahu

Dames & Moore
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Cable Address: DAMEMORE

July 7, 1986

Ms. Jacquelin Miller
Acting Associate Director
University of Hawaii
Environmental Center
Crawford 317, 2550 Campus Road
Honolulu, Hawaii 96822

DA 10

Dear Ms. Miller:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 19, 1986 and offer the following response to your comments:

Marina design

Your comment on a hydraulic model study has been well received. We will consider a hydraulic model study during the more detailed design phases of the project.

Water pollutant sources

Estimated copper concentrations were derived from a reported release rate per boat and assuming no removal by sedimentation or other processes. These worst-case computed concentrations ranged from 20 to 90 micrograms per liter (not miligrams per liter). Toxic effects due to cupric ion are observed in bodies of soft fresh water at levels as low as 20 mircograms/liter, but the sea water environment inhibits toxicity, probably because the copper reacts with carbonates and other ions present to form inactive complexes. Also, a fairly large fraction of the copper released from the surface of boat hulls remains in solid form; much of it will end up in the bottom sediments of the marina. There it may affect some of the normal bottom-dwelling organisms. As a practical matter, however, many existing small craft harbors contain boat densities similar to that proposed but still support a healthy benthic population. Organo-tin compounds are also used in antifouling paint, and their dispersal in the marina environment could also inhibit the biota to some degree.

Dispersal of polutants leaving the marina entrance channel will occur fairly rapidly because of wind currents and wave-generated turbulance. Even if all of the estimated copper input reached the ocean, the concentration at the marina mouth would be just barely at the point where inhibitory effects are observed on fresh-water plankton.

Storm drainage

The Ewa Marina Community Supplemental EIS for Increment I, March 1984, contains a Preliminary Hydrologic Report for Kaloi Stream Improvement. This report was prepared by William Hee & Associates, Inc. in March 1981 and was approved by the Department of Public Works on April 11, 1981. The developer feels that this study adequately addresses the issue.

Groundwater Infiltration

We have changed the text to indicate that the wells in Table 9, page 46 are the same as those in Table 2, page 15 . We have also emphasized that the samples represent a single well sample on one day of the year, and thus should be interpreted carefully. The heavier rainfall in late 1985 would have increased water quality. Despite this, significant water quality degredation was noted compared to previous testing. There is little doubt that drip irrigation has played a major role in chloride changes. Oahu Sugar has acknowledged this and currently plans changes to irrigation operational procedure in an attempt to counteract this.

Water quality standards

Since planktonic algae are known under usual marine conditions to assimilate C:N:P in ratio by atoms of about 106:16:1, respectively, and because the ground water data from Ewa Plain wells show a huge nitrogen excess by atoms and mass relative to phosphorus, it is presumed that phosphorus will run down to near limiting values before nitrogen, and ultimately be the limiting micro-nutrient for phytoplankton growth. Thus, if there is an excess of dissolved nitrogen and nearly zero phosphorus (as $PO_4^{\equiv}$), one would believe that huge algal blooms or noxious pollutant turbidity (based on the nitrogen data above) should not develop and cause pollutant problems. Further, nitrogen fixation in coastal marine systems would add more nitrogen to the water column without corresponding phosphorus loading, thus skewing the excess of nitrogen relative to phosphorus even further. For these reasons it is believed that phosphorus rather than nitrogen will limit plant growth in the marina waters.

See Addendum Appendix 3, Response to Concerns Regarding Water Quality, by Dr. Jed Hirota.

Volcanic aquifer

In the general vicinity of the proposed Ewa Marina, the volcanics underlying the site are those of the Koolau volcano. We have changed the text to indicate this.

Existing ground water flow

Thank you for providing us more recent pan evaporation data.

We appreciate your comments on the Draft Addendum.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno

Jennifer J. Kleveno
Assistant Environmental Scientist

MRF:JJK/lkl(3143B/154B(10):13822-001-11)

University of Hawaii at Manoa

Water Resources Research Center
Holmes Hall 283 • 2540 Dole Street
Honolulu, Hawaii 96822

23 June 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

SUBJECT: Draft Addendum to the Final EIS, Ewa Marina Community, Increment II, May 1986

We have reviewed the subject draft addendum and offer the following comments. They start first with comments on the text, followed by those on the appendix.

TEXT

1. P. 14, Evidence should be cited to support the contention that the desilting basin can reduce suspended solids from over 1000 mg/l for storms, to 100 mg/l for discharge. Attention is called to a paper by Ekern 1976 "Turbidity and Sediment-Rating Curves for Streams on Oahu, Hawaii." Also, Yamane & Lum 1985 in USGS Report 85-4265, Quality of Storm-Water Runoff, Mililani Town, Oahu, Hawaii, 1980-84, records the great variability in urban sediment loads. The major issue is the question of the effectiveness of the desilting basin to reduce Kaloi stream sediments.

2. P. 15, Table 2. The single well analysis, from 30 ft depth in January 1986, must be interpreted with great care. Fall rains in 1985 must have influenced the seasonal fluctuations as noted for return irrigation flows (Tennorio, et al. 1969; Young and Lao 1973). The DLNR well indices should also be cited.

3. P. 26. The fact that phosphorus levels only slightly exceed allowable standards does not necessarily mean that P is the limiting element for algal growth.

4. P. 39-48, Sec. E. Groundwater Hydrology. General Comments

   a. The validity of the 50% reduction in percolate under drip as compared with furrow irrigation has not been adequately established. Hence, calculations based on this predication are suspect. The data presented fail to show a causal relationship between the start of drip irrigation and an increase in nitrate and chloride. This puts in jeopardy the major contention that"... Marina construction is not expected to significantly affect the amount or quality of water available at existing irrigation wells..." (p. 48). The study says (p. 47, E. 3.2):

   > "Available information on the irrigation wells are tabulated on Table 8. Significant changes in the flow, heads, and water quality are occurring within the caprock aquifer, as a result of the change to drip irrigation and the termination of the use of pipe transported volcanic source water. This is supported by recent water quality data taken during this study, which indicates that salinity and nitrates are higher levels than previously measured."

   If Table 8 (p. 43) is the available information, it fails to support the statement following, regarding significant changes in the flow, heads, and water quality having occurred. There is no indication of when conversion to drip occurred, and what the flow, head, and water quality was before, during, and after their installation so that a comparison can be made.

   b. Fertilization practices will be substantially changed under drip irrigation, and the use of low concentration, frequent application rather than two major slugs of surface applied nitrogen should substantially reduce the opportunity for percolate loss of nitrogen.

   c. The case should be addressed for the complete cessation of cane irrigation should Oahu Sugar cease operation, a not improbable option for the next 25 year outlook.

APPENDIX 6, Groundwater Study, Dames & Moore

5. P. 2, Sec. 2.2. Ruhe, et al. 1965, "Nature of Soil Parent Material in Ewa-Waipahu Area, Oahu, Hawaii" should be cited as the definitive paper on the topography and physiography of the subject area.

6. P. 2, Sec. 2.3 Climate. The rainfall and pan evaporation tables should be updated using DLNR 1982 Circular C88 and Ekern & Chang 1985 respectively.

   The EIS has dismissed the contribution of precipitation to groundwater recharge without examining the actual rainfall record during this period in question. Tables 1.1 and 1.2 are medians and the vast majority of the stations shown are outside the subject area and have no bearing on it at all. The appropriate ones should be so designated.

7. P. 3, Sec. 2.4 Soils. The role of the 25 ft and 95 ft sea stands on the surficial features ought to be cited for their influence on the intakes and flows to the shallow 30 ft deep wells (Ruhe, 1965).

8. P. 3, Sec. 2.5 Geology. The Ruhe 1965 and Lum and Stearns 1970 are better sources than the old 1935 paper.

9. P. 11, Sec. 2.6.6 Ground Water Quality. Data from Tenorio, et al. 1969 and Young and Lao 1973, ought to be used to point out the cyclical nature of the flows, and changing composition with season, rainfall, irrigation, and fertilizer practices. This accounts for the lack of definitive nature of the single sample cited in Table 6.

   Plate 9 should be replaced with the maps from the 1984 DLNR Groundwater Index and Maps, and the identification of the wells denoted by DLNR Well No., as well as the data reported in Table 3.

10. P. 12-13. The quantity as well as mode of fertilizer application will change under drip irrigation since surface application cannot move downward in the drip, and most probably fertilizers will be applied at low concentrations with the drip water.

11. P. 17, Item 3. "Within the coralline caprock aqufers, the majority of the water found is salt water." This should be amended to read "...water found is slightly brackish to brackish."

12. P. 17, Item 3. "Relatively fresh and brackish waters are found at shallow depths, as a thin lens floating on the salt water, in general conformance with the Ghyben-Herzberg approximation." There is no known evidence to support this statement.

13. P. 18, Item 8. The points are made much better with the Tenorio et al. 1969 and the Young and Lao 1973 papers.

14. P. 18, Item 9. The derivations in Appendix C based on the 50% reduction in percolate all depend on the validity of that 50% reduction, which has not been adequately established as a fact. Thus, Conclusion No. 10 is also suspect.

15. P. C-4. Another highly probable case should be examined, which perdicates the complete demise of Oahu Sugar cane operations and irrigation, so that a fifth case of no irrigation should also be modeled.

16. Would the marina increase the discharge of the slightly brackish to brackish groundwater into the ocean? How much?

Thank you for the opportunity to comment. This material was reviewed by WRRC personnel.

Sincerely,

Edwin T. Murabayashi
EIS Coordinator

ETM:jm

cc: J.J. Kleveno, Dames & Moore
Attachments: References

REFERENCES

Ekern, P.C. 1976. "Turbidity and Sediment-Rating Curves for Streams of Oahu, Hawaii." Soil Erosion: Prediction and Control, Soil Conservation Society of America, Ankeny, Iowa, pp. 242-254.

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Lum, D. and Stearns, H.T. 1970. "Pleistocene Stratigraphy and Eustatic History Based on Cores at Waimanalo, Oahu, Hawaii," Geological Society of America Bulletin, 81:1-16, January 1970.

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Tenorio, P.A., Young, R.H.F. and Whithead, H.C. 1969. Identification of Return Irrigation Water in the Subsurface: Water Quality, Technical Report No. 33, Water Resources Research Center, University of Hawaii, Honolulu.

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Young, R.H.F. and Lao, C. 1973. "Return Irrigation Water in Hawaii," Water Resources Bulletin, American Water Resources Association, Vol. 9, No. 3, pp. 538-555.

Dames & Moore
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(808) 735-3585
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July 7, 1986

Mr. Edwin T. Murabayashi
EIS Coordinator
University of Hawaii
Water Resources Research Center
Holmes Hall 283, 2540 Dole Street
Honolulu, Hawaii 96822

DA 15

Dear Mr. Murabayashi:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 23, 1986 and offer the following response to your comments:

TEXT

1. P. 14. The Ewa Marina Community Supplemental EIS for Increment I, March 1984, contains a Preliminary Hydrologic Report for Kalai Stream Improvement. This report was prepared by William Lee & Associates, Inc. in March 1981 and was approved by the Department of Public Works on April 11, 1981. The developer feels that this study adequately addresses the issue.

2. P. 15, Table 2. We have changed the text to emphasize that the samples represent a single well sample on one day of the year, and thus should be interpreted carefully. The heavier rainfall in late 1985 would have increased water quality. Despite this, significant water quality degredation was noted compared to previous testing. Table 2 has been changed to include the DLNR well indices.

3. P. 26. Since planktonic algae are known under usual marine conditions to assimilate C:N:P in ratio by atoms of about 106:16:1, respectively, and because the ground water data from Ewa Plain wells show a huge nitrogen excess by atoms and mass relative to phosphorus, it is presumed that phosphorus will run down to near limiting values before nitrogen, and ultimately be the limiting micro-nutrient for phytoplankton growth. Thus, if there is an excess of dissolved nitrogen and nearly zero phosphorus (as $PO_4^{\equiv}$), one would believe that huge algal blooms or noxious pollutant turbidity (based on the nitrogen data above) should not develop and cause pollutant problems. Further, nitrogen fixation in coastal marine systems would add more nitrogen to the water column without corresponding phosphorus loading, thus skewing the excess of nitrogen relative to phosphorus even further. For these reasons it is believed that phosphorus rather than nitrogen will limit plant growth in the marina waters.

See Addendum Appendix 3, Response to Concerns Regarding Water Quality, by Dr. Jed Hirota.

4. P. 39-48, Sec. E. Groundwater Hydrology. General Comments

   a. We believe that the 50 percent reduction of percolate under drip irrigation as compared to furrow irrigation is conservative. Initial estimates have been that drip irrigation could reduce percolate by as much as 80 percent, under ideal conditions. Actual field conditions do not allow such a high rate of efficiency but the actual reductions probably are higher than 50 percent. Using a higher figure would result in much greater effects due to the conversion to drip relative to the effects of the marina.

      Our selection of 50 percent was based on figures developed by Oahu Sugar in developing water budgets for Oahu Sugar's groundwater allocation from the DLNR.

      There is little doubt that there is a causal relationship between the start of drip irrigation and decreases in water quality. Oahu Sugar realizes this and plans changes to the operation of the irrigation system to attempt to counteract this.

   b. Drip irrigation was initiated in 1973 and substantially completed by 1978. We do not know if fertilization practices were changed with the conversion to drip irrigation. It appears that nitrogen levels have increased.

   c. The ground water study was initiated primarily as a result of Oahu Sugar's concerns. Therefore, the case of complete ending of cane irrigation was not considered.

APPENDIX 6, Groundwater Study, Dames & Moore

5. P. 2, Sec. 2.2. Based on review of the cited references, use of the additional data would not change results.

6. P. 2, Sec. 2.3 Climate. Again, based on review of the cited references, the additional data would not change results.

   In the course of our groundwater modeling, the contribution due to precipitation was included in the modeling and was not "dismissed" as stated.

7. P. 3, Sec. 2.4 Soils. Although the 1935 Stearn's paper is cited, the majority of the Geology Section is clearly based on relatively recent subsurface boring and well data which were unavailable to the authors of the cited references.

8. P. 3, Sec. 2.5 Geology. (See answer to 7.).

9. P. 11, Sec. 2.6.6 Ground Water Quality. (See answer to Item 4. a.). Plate 9 was extracted from the 1984 DLNR groundwater index and maps, as well as, the data on Table 3.

10. P. 12-13. (See answer to 4. b.).

11. P. 17, Item 3. Slightly brackish to brackish water is found only within the upper portion of the coralline caprock. Within the entire approximate 1,000-foot thickness of the caprock, most of the water is salt water.

12. P. 17, Item 3. Depth salinity profiles taken at various locations on the Ewa Plain have found a thin lens of relatively fresh to brackish water floating on salt water.

13. P. 18, Item 8. The cited references appear to support the point made.

14. P. 18, Item 9. (See answer to 4. a.).

15. P. C-4. (See answer to 4. a.).

16. The marina would not effect the groundwater flow quantity.

- oOo -

Yours very truly,

DAMES & MOORE

Original signed by

Masanobu R. Fujioka, P.E.
Certified Professional Hydrologist #107
American Institute of Hydrology

MRF:lkl(3143B/154B(15):13822-001-11)

HEADQUARTERS
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860

IN REPLY REFER TO:
11010
Ser 002(202)/3989
23 JUN 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

DRAFT ADDENDUM TO THE FINAL EIS, EWA MARINA COMMUNITY,
INCREMENT II EWA, OAHU, HAWAII

In its letter of May 21, 1986, the State of Hawaii, Office of Environmental Quality Control provided a copy of the draft addendum for review and comment. The purpose of this addendum is to address the deficiencies cited by the City and County of Honolulu, Department of Land Utilization and the Navy's comments are as follows:

a. This project does not adversely impact the NAS Barbers Point AICUZ plan

b. The White Plains beach area located on the west side of the boundary line should be considered a possible warning area for boaters entering and exiting the marina. Possible course of action to ensure safety of swimmers and surfers is to install caution signs or channel markers.

c. Effects on the shore line is a major concern. Although Nimitz Beach was addressed adequately, of greater concern is White Plains Beach. White Plains Beach is approximately half a mile west of the proposed channel entrance whereas Nimitz Beach is approximately one mile west of White Plains Beach. Sand movement and erosion due to the Marina construction should be addressed for this beach. It should also be noted that there are several cottages at the shoreline of White Plans Beach which will be affected if serious erosion problems are experienced from the construction.

d. The Ewa Marina roads and traffic area would have a definite impact on NAS Barbers Point. Two factors should be considered:

1. As stated by Kahu Associates in the final EIS, approximately 3420 cars utilized Geiger Road from the Ft Weaver-Geiger Road intersection in and out of Barbers Point. With the development of the Ewa Marina complex, this traffic would increase as Navy personnel would surely move into the development. The final EIS states that 85 percent of the estimated 39,790 trips daily would be distributed outside the Ewa Beach area. This total would be 33,522. Add to that the existing 10,850 who traverse the Geiger Road intersection at Ft Weaver Road, the total would be 44,372. The report goes on to say that widening the Ft Weaver Road would solve the problem; however, there would undoubtedly be longer traffic delays encountered than at the present time. This has not been thoroughly examined.

2. A proposal to alleviate the traffic problem is to construct a second North/South roadway. The proposal (figure 26 of the final EIS) shows that this road would intersect Geiger Road within one-half mile of that gate entrance to NAS Barber Point. The study has not thoroughly investigated the security aspects that the Naval Air Station has to contend with. With the increased threat of terrorism, security has been tightened at NAS Barbers Point. The gates have been closed periodically for reasons of security. Currently, during gate closures, security checks and morning peak rush traffic, lines of vehicles exceed one mile. With these factors being brought into focus, the roadway structure should be reevaluated before starting construction.

Thank you for the opportunity to review and provide comment on the subject addendum. Please ensure that the Navy has an opportunity to review any further documents on Ewa Marina projects.

Sincerely,

HENRY I RINNERT
Captain, CEC, U.S. Navy
Facilities Engineer
By direction of the Commander

Copy to:
Ms Jennifer J. Kleveno
Assistant Environmental Scientist
Dames and Moore
1144 10th Avenue Suite 200
Honolulu, Hawaii 96816

Reproduced at Government Expense

Dames & Moore
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(808) 735-3585
Cable Address: DAMEMORF

July 7, 1986

Captain Henry J. Rinnert
CEC, U.S. Navy
Facilities Engineer
Headquarters
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96860

DA 25

Dear Captain Rinnert:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 23, 1986 and offer the following response to your comments:

a. From your comment, we understand that the project does not adversely impact the NAS Barbers Point AICUZ plan.

b. Channel markers, including lighted buoys, beacons and range markers, will be installed and will conform with U.S. Coast Guard requirements. The White Plains beach area will be considered as a possible warning area for boaters entering and existing the marina.

c. In addressing littoral processes, the marina engineers made no distinction between White Plains Beach and Nimitz Beach. Nimitz Beach was assumed to include the entire shoreline abutting Barbers Point Naval Air Station.

d. The March 1986 Traffic Study by Kaku Associates has been incorporated into the Final Addendum as Appendix 7. Also included in Appendix 7 is recent correspondence between the developer and the State Department of Transportation (DOT). The correspondence is enclosed for your information.

1. We believe this point has been thoroughly examined. Please refer to the Traffic Study.

2. As discussed in the enclosed letters, the developer will be updating the Ewa Marina Traffic Study at least every three years commencing three years following completion of the first residential unit. These updated studies will be coordinated

with and approved by the State DOT and the City Department of Transportation Services. The Navy will also have the opportunity to review and comment on the traffic studies.

We appreciate your comments.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3143B/154B(25):13022-001-11)

Enclosures

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
P. O. BOX 50004
HONOLULU, HAWAII 96850

June 13, 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Subject: Ewa Marina Community Increment II, Honouliuli, Ewa, Oahu

We reviewed the subject Draft Addendum to the Final EIS and have no comments to make:

Thank you for the opportunity to review the document.

Sincerely,

RICHARD N. DUNCAN
State Conservationist

cc:
Ms. Jennifer J. Kleveno
Assistant Environmental Scientist
Dames and Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816

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June 27, 1986

Mr. Richard N. Duncan
State Conservationist
United States Department of Agriculture
Soil Conservation Service
P. O. Box 50004
Honolulu, Hawaii 96850

DA 8

Dear Mr. Duncan:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 13, 1986 and understand that you have no comments on the Draft Addendum. Thank you for responding.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3109B/154B(8):13822-001-11)

U.S. Department of Transportation
United States Coast Guard

Commander (dpl)
Fourteenth Coast Guard District

Prince Kalanianaole
Federal Building
300 Ala Moana Blvd.
Honolulu, Hawaii 96850
Phone: (808)546-2861

16475.2/2-85
Serial No. 6/120
25 June 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, HI 96813

Dear Mr. Whalen:

The Fourteenth Coast Guard District has reviewed the DRAFT ADDENDUM TO THE FINAL ENVIRONMENTAL IMPACT STATEMENT for the EWA MARINA COMMUNITY INCREMENT II, and has no objection or constructive comments to offer at the present time. Our previous concerns with this project to have been addressed satisfactorily.

Sincerely,

Jay Silberman
Environmental Protection Specialist
District Planning Office
By direction of Commander,
Fourteenth Coast Guard District

cc: Ms. Jennifer J. Kleveno

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-3585
Cable Address: DAMMOORE

June 27, 1986

Mr. Jay Silberman
Environmental Protection Specialist
District Planning Office
United States Coast Guard
Fourteenth Coast Guard District
300 Ala Moana Boulevard
Honolulu, Hawaii 96850

DA 19

Dear Mr. Silberman:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 25, 1986 and understand that you have no comments on the Draft Addendum. Thank you for responding.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3109B/154B(19):13822-001-11)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P O BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307

JUN [illegible] 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Re: Ewa Marina Community Increment II, Ewa, Oahu

Dear Mr. Whalen:

We have no additional comments on the Draft Addendum and Appendix to the Final Environmental Impact Statement (EIS) for the Ewa Marina Community Increment II. Our office will provide additional comments to the U.S. Army Corps of Engineers during the review of the Federal EIS for this project.

We appreciate this opportunity to comment.

Sincerely,

William B. Erazer
FOR Ernest Kosaka
Project Leader
Office of Environmental Services

cc: Dames and Moore
NMFS
CE, Operations Branch

DAMES & MOORE
JUN 24 1986
ROUTE TO: DAH

1

Dames & Moore

1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-3585
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June 27, 1986

DA 14

Ernest Kosaka
Project Leader
Office of Environmental Services
United States Department of the Interior
Fish and Wildlife Service
P. O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Kosaka:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 23, 1986 and underatand that you have no additional comments on the Draft Addendum, but plan to comment on the Federal EIS. Thank you for responding.

Yours very truly,

DAMES & MOORE

Jennifer J. Klaveno

Jennifer J. Klaveno
Assistant Environmental Scientist

JJK(3109B/154B(14):13822-001-11)

HAWAIIAN ELECTRIC COMPANY, INC. · PO BOX 2750 · HONOLULU, HI 96840 0001

ENV 2-1
NV/G

HEI

Brenner Munger, Ph.D., P.E.
Manager
Environmental Department
(808) 548 6880

June 25, 1986

DAMES & MOORE HONOLULU
JUN 27 1986
ROUTE TO: DA20

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Subject: Environmental Impact Statement for Ewa Marina Community Increment II

We have reviewed the above subject EIS and have the following comments:

1. We have no comments on the Draft Addendum as it only addresses the concerns raised by the City and County of Honolulu, Department of Land Utilization, during their review of the final EIS.

2. HECO's concerns with the Draft EIS, as stated in our comments dated October 22, 1985, have been adequately addressed.

Sincerely,

Brenner Munger

cc: Ms. Jennifer J. Kleveno
Dames & Moore

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, Hawaii 96816
(808) 735-1585
Cable Address: DAMEMORE

June 27, 1986

Dr. Brenner Munger
Manager
Environmental Department
Hawaiian Electric Company, Inc.
P. O. Box 2750
Honolulu, Hawaii 96840-0001

DA 20

Dear Dr. Munger:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 25, 1986 and understand that you have no comment on the Draft Addendum and that your previous concerns have been adequately addressed. Thank you for responding.

Yours very truly,

DAMES & MOORE

Jennifer J. Kleveno
Assistant Environmental Scientist

JJK(3109B/154B(20):13822-001-11)

OAHU SUGAR

P.O Box 0
Waipahu, Hawaii 96797
(808) 677-3577

Amfac

June 16, 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, HI 96813

Gentlemen:

Subject: Comments on Draft Addendum to the Final Environmental Impact Statement (EIS) and Associated Appendix for Ewa Marina Community Increment II

We have received and reviewed the subject documents and would appreciate very much the opportunity to have our comments on them heard. Our comments are in regards to Section E--Groundwater Hydrology and its associated Appendix 6--Groundwater Study.

We do not agree with some of the conclusions made, nor are we fully convinced of the validity of some of the conclusions made in the study; further, we do not agree with certain aspects of the rationale used in the study to ascertain the magnitude of the impact of the marina on the Ewa Caprock Groundwater Aquifer.

As OSCo uses the water drawn (approximately 20 to 25 million gallons per day--mgd) from the topmost caprock aquifer by way of seven existing fixed elevation skimming type wells to irrigate approximately 2,800 acres, or 20% of its sugarcane crop area, the quality and the quantity of water pumped from these wells, as well as the groundwater head levels of these wells, resulting from the proposed dredged marina, are its primary Ewa Marina Community Increment II EIS concerns.

Any degradation of the current water quality or decrease in the current amount of water able to be drawn from these wells will correspondingly reduce the amount of sugar produced on these lands and thus adversely affect this company's ability to stay in business. Up to certain limits OSCo can cope with reduced caprock head levels, decreased flows, and increased water salinities; however, beyond certain limits any reduction in head, quality, or quantity renders these wells totally useless to OSCo (unless huge capital expenditures are made to modify the wells, pumps, and treatment systems) and would result in disastrous crop failures.

Our specific points of contention with the EIS addendum and its appendix are as follows:

1. The rationale the applicant's consultant used in determining the magnitude or severity of the impact of the projected marina on the usefulness of OSCo's present wells. The consultant does not specifically address the effect of the marina on the present existing state of the caprock aquifer head level; rather they address the effect of the marina on caprock head levels that occurred 10 years ago—their so-called "pre-drip irrigation" scenario. The consultant tends to ignore the fact that most of the transition in caprock aquifer head levels from the pre-drip irrigation to the post-drip irrigation periods has already occurred in the last 8 to 10 years (just as the consultant's hydraulic model predicted), since the completion of conversion to drip irrigation; the post-drip head level is indeed the present condition of the caprock aquifer and thus should be used as the baseline of any comparison made in this EIS. Not to use the present existing conditions as the baseline for comparisons, but rather to use a past head level history baseline does not make sense (it also biases the report's conclusion in favor of the project); the consultant's report referencing predicted head levels to past obsolete head level data tends to confuse the issue. The issue from our point of view is the effect of the marina construction on the present state of the aquifer--the fact that conversion to drip irrigation has occurred should be accepted; the point of this EIS should be: What happens from this point in time and onward if the marina is built? To make a blanket comparison of the predicted marina head loss with a historical head loss and then to use this comparison as the primary determinant of the magnitude of impact without regard to the current state of affairs is in our opinion not valid.

   A more logical and more acceptable approach to assess the impact might be to definitively state or quantify the head levels or head level range that is occurring or will occur at the post-drip steady state condition. From this statement, an assessment of OSCo's current utilization potential (to include salinity; well capacity with the existing well, sump, and equipment configuration; sustainable draft; operating mode; and energy and other operating costs) of each of its caprock wells and pumps can be made. The consultant's hydrologic model or one that is more acceptable can then be applied to determine the projected head loss attributable to the Ewa Marina project, from these projected head levels a new pump and well utilization potential assessment can then be made; the difference between the present utilization assessment and the projected utilization assessment would then be, from OSCo's point of view, the environmental impact of the proposed marina on its caprock irrigation wells.

2. It should be recognized that each well and each pump site and its physical layout is unique (e.g. pump type, submergence, sump configuration, collection tunnel or ditch dimensions, head levels, proximity to project site, etc.). From our point of view

individual well-by-well and pump-by-pump assessments should be made. Shallow pumps and wells and wells closer to the project would tend to be more affected than deeper wells and more remotely located sites. Judging from the documents and exhibits, we have concluded that such a detailed investigation has not been made.

3. We have not been fully convinced that water quality degradation at our irrigation wells will not occur as a result of the marina "moving the shoreline" closer to OSCo's well sites. In the cases of OSCo's EP24 and EP27 wells, these wells are closest to the marina, and will be moved 1,800 feet, or 52%, and 675 feet, or 38%, closer to the shoreline; this is a move so great that it is inconceivable that these wells will not be adversely affected. The report's brief discussion on increasing salinity of the caprock aquifer as one approaches the shoreline due to "direct hydraulic connection" and "mixing action due to tides" does not specifically state at what distance from the shoreline that this action becomes great enough to present a problem to Oahu Sugar's wells. Perhaps a series of borings spaced every 100 feet strung out from the shoreline to a distance of 2,000 feet in from the shore, in the vicinity of the marina, should be drilled and pumped, and its groundwater sampled periodically will give an indication of the effects of tidal induced mixing and direct hydraulic connection of ocean water on the salinity of the caprock aquifer.

4. OSCo does not have enough expertise to judge the validity of the hydrologic model presented by the applicant's consultant; it is hoped that other more expert parties and agencies will comment on the applicability and validity of the model used. However, we do have a wealth of practical and local knowledge and experience in managing and dealing with the caprock aquifer. Our experience leads us to expect and fear that there will be significant localized and widespread dewatering of the caprock aquifer should the marina as planned proceed, significant enough that if not properly handled, could seriously affect our existing wells and pumping stations; and consequently our crops, profitability, and survival. The consultant's report briefly alludes to the initially increased groundwater flows into the proposed marina "while groundwater in storage in the near vicinity of the marina drains." The report fails to define the areal extent of the "near vicinity"; with OSCo's nearest well now only 1,125 feet from the marina, we would like that affected area pinpointed so that we will know if and how we will be affected.

5. A point that is puzzling and confusing to OSCo is one that has been briefly mentioned previously. That point is the consultant's contention early on in their Groundwater Study that the transition from pre-drip to post-drip steady state head levels will take 8 to 10 years, contrasted with their contention later on in their report that the effects of drip-irrigation will be of long duration and will occur concurrently with the dewatering effect of the marina.

As OSCo's drip conversion program of the fields overlying the caprock aquifer was initiated in 1973 and essentially completed in 1978, by the consultant's own projection, the post-drip steady state head levels should essentially be presently in place. However, the report states:

"It is anticipated that the effects of the change to drip irrigation will not be fully realized for many years. Therefore the effects of marina construction will occur at the same time that the effects of drip irrigation occur."

The above quoted statement in light of the 8 to 10-year projected transition period is somewhat contradictory and confusing, and should be clarified.

6. Referring again to the above quoted excerpt in item 5, from the consultant's report, the second sentence of the statement concerning concurrent occurrence of drip and marina effects, could have sinister implications for OSCo. Suppose that the marina is built and that the model used in projecting the head loss is flawed, and the actual head loss due to the marina is much larger than predicted. Consequently, due to the purported ongoing long term effects of drip irrigation conversion, the extraordinary head loss due to the marina could be masked, and therefore could be difficult to detect, assess, and identify as an environmental impact of the marina construction. OSCo could possibly suffer grievously; further, this loss, directly associated with the marina project, would be very difficult to prove, and leave OSCo with very slim chances of legal redress and compensation for its losses resulting from a faulty prediction in the EIS.

In our view, the permitting authority has two prudent choices that they could make to protect OSCo's interests:

a. Defer dredging of the marina until it has been determined that the post-drip steady state aquifer condition has been reached, and a basis for comparison is established; and/or

b. As added conditions to the desired permit, require the applicant to prepare a caprock aquifer monitoring plan to include a series of monitoring wells and by this and by other means monitor the condition of the caprock aquifer at appropriate intervals prior to, during, and subsequent to the construction of the marina; by these means any abnormal changes to the aquifer due to the marina might be detected. As a further condition to the permit, require the applicant to place in escrow a sum of money, to be determined by the permitting authority, to be held to compensate OSCo or any other party found to be injured due to the unanticipated caprock aquifer degradation

resulting from the marina construction, or to be held to be used for remedial work upon the caprock aquifer.

To sum up our reactions to the EIS addendum and appendix regarding the impact of the marina on the caprock aquifer, it is our view that the report dwells too much on OSCo's conversion to drip irrigation and not enough on the specifics of quantifying and pinpointing the effects of the marina on the caprock aquifer. It is more convenient to explain away and blame all the negatives of the project on the apparent and easier to quantify actions of OSCo than it is to generate detailed and accurate predictions of the marina's effect from a theoretical model, applied using data and inputs derived from a viable, non-homogeneous aquifer, whose parameters are not easily or precisely determined. Then to apply these predictions to individual pump and well sites and to make future utilization potential assessments makes the task all the more difficult, cumbersome, and subject to and more susceptible to error, differences of opinion, and challenges of assumptions and facts by the reviewers. Further, it is not difficult to inadvertantly confuse or divert attention away from the relevant issues if one asserts that the effects of the marina will occur concurrently with the long-term drip conversion effects, and to imply that the marina effects may well be difficult to distinguish from the effects of drip conversion. From our point of view the groundwater report needs more meat--isohyets or contour lines of the caprock aquifer head levels in the vicinity of the marina, individual pump and well utilization assessments, definition and pinpointing of zones of effects and concentrations; and this information must be compared with the present day state of the aquifer, and not compared to some past idealized, utopian state of affairs. If this is done, we would have at least a substantive evaluation of individual wells (not a generalized blanket state of affairs, ignoring specific pump station geometries) which can then be translated into a strategic business plan. It is not an easy task, nor an inexpensive task, and we may not agree with the resulting assessments, but from our point of view it is a necessary step if we are to rationally ascertain the impact of the Ewa Marina project on OSCo.

The applicant's groundwater consultant is aware of some of our concerns, the draft report in appendix 6 was forwarded to OSCo, and our comments were returned to them in the enclosed letter dated April 17, 1986. Subsequently a meeting with the consultant, Dames and Moore, the Army Corps of Engineers, and OSCo was held at OSCo in May, at which time our points of views were exchanged and briefly discussed. As we view the consultant's assessment in the addendum to the EIS, their originally expressed conclusions and views have not changed.

Let me make it clear that OSCo is not opposed to the project provided that it can be assured that it can continue to irrigate and cultivate its crops on its remaining crop areas in the caprock area in an economical manner, or that it be justly compensated for the additional expenses or yield declines that it may suffer resulting from the project's environmental impacts. OSCo acknowledges its role in lowering head levels the caprock aquifer, but it should be realized that without OSCo and its predecessor, Ewa Plantation Company, this resource would not now exist. OSCo is bearing and will continue

to bear the expenses associated with pumping from the lowered aquifer head levels resulting from its own drip conversion actions. It will be hard pressed to bear any additional expenses resulting in degraded quality or quantity due to dewatering of the aquifer by the Ewa Marina. If assurances can be given to OSCo that it will not bear an unjustified additional cost burden or suffer uncompensated yield or income loss, then we have no objections to the permitting authority granting this special use permit for the Ewa Marina Project.

I would like to thank you for your kind attention and consideration of our comments and beliefs, and hope that these thoughts will assist you in arriving at a fair and equitable decision.

Very truly yours,

W. D. Balfour, Jr.

W. D. Balfour, Jr.
President and Manager

HM:yk

enc.

cc: Ms. Jennifer J. Kleveno, Dames and Moore

OAHU SUGAR

PO Box 0
Waipahu, Hawaii 96797
(808) 677 3577

Amfac

April 17, 1986

Dames & Moore
1144 10th Avenue, Suite 200
Honolulu, HI 96816

Attention: Ms. Jennifer J. Kleveno
Assistant Environmental Scientist

Dear Ms. Kleveno:

Subject: DRAFT GROUNDWATER STUDY FOR THE PROPOSED EWA MARINA COMMUNITY

Thank you for the opportunity to review and comment on the subject study; it is well written and very informative.

However, from Oahu Sugar Company's standpoint, this report does not satisfactorily address our concerns regarding the degradation of the caprock aquifer resulting from the dredging of the project's proposed marina. Our concerns can be stated in one rather involved question, and is as follows:

"Should the marina be built, can Oahu Sugar Company continue to pump the same quality and quantity of water that it presently does, with the same equipment that it presently has installed at each of its well sites, with the same level of operational facility, at the same schedule, and at the same operational cost; if not, at what levels and what costs can continued pumping be sustained?"

It is Oahu Sugar Company's position that it is MSP4's responsibility, and Dames & Moore's responsibility as MSP4's agent, to specifically state whether and how each of Oahu Sugar's facilities will be affected by the marina construction project, and take responsibility for the remedy of any and all consequences of their actions.

To help ascertain the effect of the marina project on our facilities, we had hoped that your report would have addressed these two questions:

1. Assuming that Oahu Sugar Company continues to pump at the maximum historical rates, what would be the projected steady state pumped water salinities, the maximum transient salinities, and the duration of the transition period to steady state, at each of Oahu Sugar Company's caprock wells?

2. What would be the projected head levels at each Oahu Sugar's caprock wells, the duration of the transition period, and how would these projected levels compare to the current post-drip irrigation/pre-marina head levels?

Further, to properly answer the second part of our initial question regarding whether Oahu Sugar's present pumping equipment will be capable of pumping water from the caprock wells at the projected lowered head levels, and at what cost, will require an examination of the existing systems' physical layout, current and past head levels, pump and systems' performance characteristics, and maintenance and operational histories. Much of this information will almost certainly have to be gathered and compiled by Oahu Sugar's staff. Naturally, should you decide to further pursue this line of investigation, Oahu Sugar will cooperate as much as it can, but it must be realized that assisting you will divert its staffing and manpower away from its ongoing operations and projects, and hence will require compensation for our lost opportunity costs.

You may not be aware of this, but Oahu Sugar Company is presently experiencing operational difficulties with its caprock wells and pumps due to lower caprock aquifer heads levels associated with the drought of the last three years and conversion to drip irrigation---which, of course, your report dwells so heavily on. In addition, salinities of the waters pumped have increased (a point which unfortunately your report fails to address to our satisfaction) to a point where it is seriously affecting our crop yield. The report's contention that, because the projected drop in head due to the marina construction is only between 1.2 to 13.3 percent of the experienced head drop due to conversion to drip irrigation, the head loss resulting from construction of the marina will not be significant; is not accepted by Oahu Sugar Company. From our point of view, the heads at our caprock wells are already at critical levels, and can ill afford to be lowered any further, however "minor" the drop, without an in depth well-by-well examination and assessment of each site's pumping future as affected by the proposed marina construction. The construction of the proposed marina may be the proverbial "straw that broke the camel's back," that could force Oahu Sugar Company to bear undue extra expenses, or even force it to cease cultivation of the caprock area---a very great sacrifice.

I am sure you are aware of the woes of the domestic sugar industry, and I will not burden you with a recap of our "horror stories," suffice to say that Oahu Sugar Company cannot afford to expend out of its own pocket any funds to rehabilitate its facilities should the head drop in the caprock aquifer accompanying the marina construction render these facilities economically inoperable. From a financial and a strategic point of view, a definitive statement of each well's projected pumping future resulting from the marina project is vital, this will allow Oahu Sugar Company to plan for and incorporate the consequences of this project into its "Company Survival Plan."

I hope that you now understand where we are coming from, and the reasons and rationale for our position. I sincerely hope that in your next

draft, you will be able to address the questions and concerns we have raised on a well-by-well, site-by-site, and on a pump-by-pump basis.

I look forward to further discussions with you and between our staffs.

Very truly yours,

W. D. Balfour, Jr.
President and Manager

WM:yk

cc: Corps of Engineers
The Campbell Estate (Mr. O. K. Stender)
State of Hawaii DLNR, DOWALD (Mr. H. Tagomori)

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(808) 735-3585
Cable Address: DAMEMORE

July 7, 1986

Mr. W. D. Balfour, Jr.
President and Manager
Oahu Sugar Company
P. O. Box O
Waipahu, Hawaii 98797

DA 21

Dear Mr. Balfour:

Response to Comments
Draft Addendum to the
Final Environmental Impact Statement
Proposed Ewa Marina Community
Increment II

We have received your letter of June 16, 1986 and offer the following response to your comments:

1. We wish to emphasize that there is no such thing as a "present existing state" for the caprock aquifer. The caprock aquifer is in a state of transition due to the actions of Oahu Sugar. We do not agree with Oahu Sugar's contention that most of the transition of the caprock aquifer head levels from the pre-drip irrigation to the post-drip irrigation period has already occurred. There are two main factors behind the reductions in head and water quality that have been observed recently within the Ewa Marina caprock. These are the transition from furrow irrigation to drip irrigation and second, the phasing out of import of outside irrigation water by Oahu Sugar.

   The second factor has much greater immediate affect and would have immediate impacts on ground water quality. This is reflected in the very dramatic changes in water quality recently observed. Based on this, we understand that Oahu Sugar now plans to return to the import of water for irrigation purposes. The first factor, changeover from furrow to drip, is a much more long term effect. The changes due to this factor are those that were analyzed in our computer model and should not be confused with the changes due to the second factor described above.

   Our analysis has shown that the effects due to sugar company operations are much more significant than any possible effects due to marina construction. The marina results in very small head reductions of 0.05 to 0.19 feet, and no reduction in flow quantity. The flow quantity actually increases due to less pumpage at EP24 by Ewa Marina than by Oahu Sugar, and water quality in Oahu Sugar's remaining wells are actually positively affected. As a result it is futile to try to isolate the effects of marina construction by making an assumption regarding a non-existing "present existing condition".

   In our opinion Oahu Sugar should recognize the fact that their operations and their operations alone have major impact on the heads and groundwater quality within the Ewa Plain. The possible effects of the marina are insignificant compared the effects due to to day-to-day operational decisions made by Oahu Sugar.

2. The points made under Item 1 above also apply to this point. Water quality and heads within the Ewa Plain are entirely within the control of Oahu Sugar. A detailed study of every water withdrawal installation of Oahu Sugar would not be appropriate as there are no significant factors affecting water quality at these locations other than how Oahu Sugar operates. Day-to-day operations of Oahu Sugar affect ground water quality and heads. Other factors are insignificant.

3. We wish to point out that EP24 wells will no longer be Oahu Sugar wells following the development, but will be transferred to the Ewa Marina development. We also wish to reiterate that although the flow length is reduced in some cases as stated by Oahu Sugar, by as much as 52 percent, there is no reduction in the flow quantity. Ewa Marina will pump less water than Oahu Sugar currently does and water quality would probably improve.

   Drainage in the near vicinity of the proposed marina refers to the drainage from storage of fresh water within the brackish water lens, which is currently approximately 80 feet thick. This lens will have to drain sufficiently so that the thickness of the lens adjacent to the marina is reduced to less that 5 feet. This is a localized phenomenon limited to the immediate vicinity of the marina. This will affect an area approximately 2 to 3 times the initial lens thickness, approximately 160 to 240 feet.

   The mixing action of tides is also limited to this area, where the average tidal variation of approximately 1 foot (at the ocean) is more significant as compared to the lens thickness.

5. This item is addressed under Item 1, i.e. there are two separate factors in affect. Also, the analytical single-well model cited only serves as a check. We believe the rate of decay would be much longer. The important points are that Oahu Sugar's operations are highly variable and their operations have overwhelming effect on the groundwater system, relative to other factors.

6. We again reiterate that Oahu Sugar has nearly total control over the groundwater quality and heads within the Ewa Plain. It would not be reasonable to impose conditions on other users of the groundwater system, as these other users have no control over Oahu Sugar's operations, which ultimately determine the groundwater quality of the Ewa Plain.

In our discussions with Oahu Sugar, we have tried to convey a realization that the groundwater resource on the Ewa Plain was not only created by sugar operations but, continues to be totally controlled by them. The fact that Oahu Sugar is continuing to press for economic relief, is in our opinion more related to the question of the economic viability of sugar cultivation on the Ewa Plain.

It should be noted that the Ewa Marina development does plan to monitor groundwater within the boundaries of the development, to validate findings and also to check for possible changes due to Oahu Sugar's operations. The development would be agreeable to exhanges of technical and operational data with Oahu Sugar, as joint users of the groundwater resource.

Yours very truly,

DAMES & MOORE

Original signed by

Masanobu R. Fujioka, P.E.
Certified Professional Hydrologist #107
American Institute of Hydrology

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